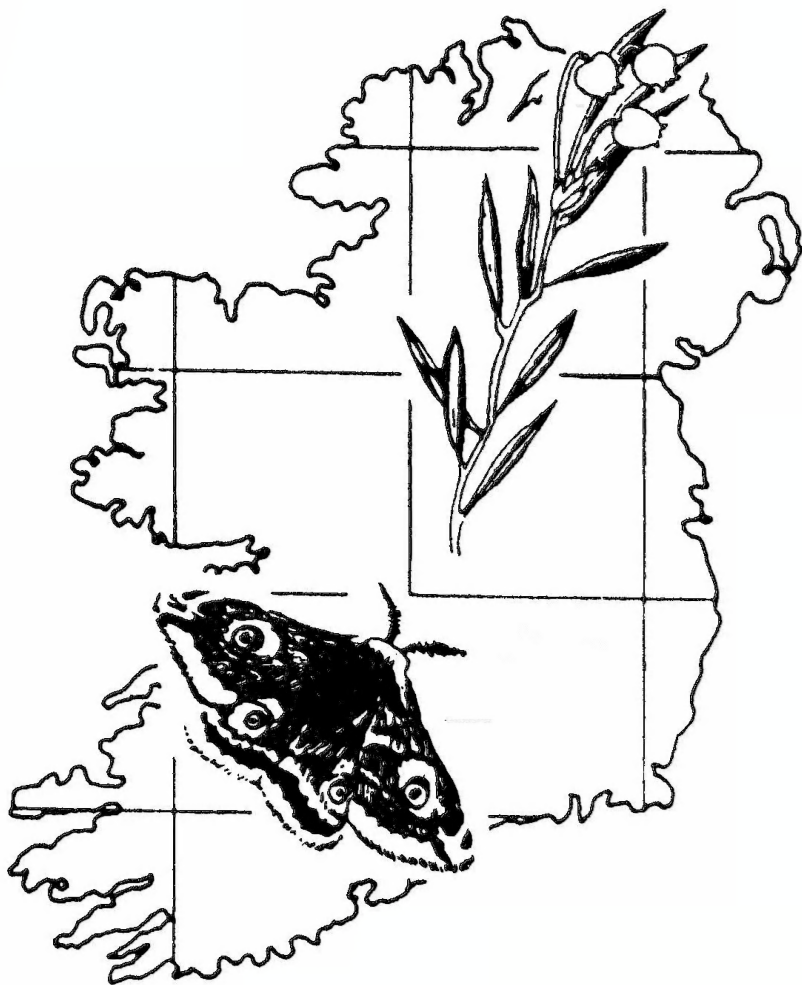


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BULLETIN OF THE IRISH BIOGEOGRAPHICAL SOCIETY

Number 45

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Editorial

The Society's website <<http://www.irishbiogeographicalsociety.com>> has proved to be popular with members and is now a useful source of information for anyone interested in Irish Natural History. As a result, the papers in this Bulletin will be made available on the site as downloadable PDFs. We will continue to make further papers accessible as PDFs. This year the Society published Occasional Publication **Number 13** in association with the Environmental Protection Agency. Entitled *Atlas of the Irish Trichoptera (Caddisflies)*, it is a companion volume to Occasional Publication **Number 11** *A catalogue and atlas of the caddisflies (Trichoptera) of Ireland*. Further details will be found on page 125.

Bulletin **Number 45** contains a very interesting mix of papers. Declan Murray continues his important research on the Irish chironomids. Occasional Publication **Number 12** *Chironomidae (Diptera) of Ireland – a review, checklist and their distribution in Europe* can now be downloaded as a PDF from the Irish Biogeographical Society's website where readers can learn of Declan's great contribution to our knowledge of these non-biting midges. There are also articles on Irish caddisflies and stoneflies with interesting contributions on *inter alia* wing-crumpling in the Plecoptera (Hugh Feeley *et al.*) and the discovery of a third Irish county for the beautiful and endangered sedge *Hagenella clathrata* (Myles Nolan). Myles also records two spiders new to the Irish fauna (one with Alison O'Reilly) and confirms the presence of another.

Martin Cawley provides a very useful indexed bibliographical checklist of the Irish Harvestmen while Declan Quigley with Liam MacNamara describes the second Irish record of the drift endocarp of the Blister Pod or Cojon de Burro, *Scaoglottis amazonica*. In a paper dedicated to their deceased co-author, Phil Withers, Jervis Good and Tom Gittings give a fascinating account of the use of moth flies as indicators of the effects of the lined Kildare bypass motorway on tufa spring habitat at Pollardstown Fen.

It is becoming increasingly common that new Irish recording schemes, particularly on social media, are apparently unaware of previously published work. To alleviate this problem, the editor is presently completing a *Bibliography of Irish insects* (1802-2020). This will be published in 2022 on our website as Occasional Electronic Publication **Number 2**. It will be a downloadable PDF which can be searched.

As in previous years, I would like to thank the authors and referees for such an interesting Bulletin, and our sponsors whose essential financial support is greatly appreciated.

J. P. O'Connor
Editor
23 October 2021

REVISED INSTRUCTIONS TO AUTHORS

1. Submitted manuscripts should follow the format of articles in *Bulletin* **Number 45** and other recent issues. The titles of journals should be given in full in the references. The references should be arranged alphabetically with, where relevant, Anon. appearing first.

2. Manuscripts may be submitted by e-mail to the Editor at <joconnor@museum.ie> or *via* our Treasurer Mr John Walsh at <ampersandwalsh@gmail.com>. Figures and photographs should be sent as jpegs. Complex tables should also be sent as jpegs and not in Excel. Remember that all figures and tables should be submitted in a type size which will remain legible after reduction to A5.

3. Word is preferred and Times New Roman 13pt should be used.

4. Records: please ensure that, when possible, the following information is incorporated in each record included in a manuscript:-

(a) latin name of organism.

(b) statement of the reference work used as the source of nomenclature employed in the text. The describer's name should be also given when a zoological species is first mentioned in the text.

(c) locality details including at least a four figure Irish grid reference (e.g. N3946), county or vice-county and some ecological data about the collection site, plus date of capture.

(d) collector's name and determiner's name (where different from the collector's name), and

(e) altitude data should be included where relevant.

5. Each year, the closing date for submissions will be the 15 October for that year's *Bulletin*. Mss received after that date will be considered for the following year's *Bulletin*. All papers will be refereed and any major changes referred to the author(s) for consideration.

ADDITIONAL RECORDS OF CHIRONOMIDAE (DIPTERA, INSECTA) IN IRELAND WITH NEW COUNTY RECORDS FROM DONEGAL AND MEATH

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Abstract

Records are given for 27 species of Chironomidae (Diptera, Insecta) from Counties Cavan, Donegal, Kerry, Mayo and Meath in Hydrometric Areas (HAs) 7, 8, 22, 25, 29, 32, 34, 36 and 38. *Parachironomus tenuicaudatus* (Malloch, 1915) is reported for the first time in County Meath, HA7 and the Eastern River Basin District. *Tanytarsus medius* Reiss & Fittkau, 1971 is reported as new for County Donegal and HA38.

Key words: Chironomidae, Diptera, records, County, Hydrometric Area, distribution, Ireland.

Introduction

The prevailing Covid 19 pandemic restrictions on travel in Ireland reduced opportunities for fieldwork and collection of Chironomidae (Diptera, Insecta) during 2021. However, some collections were obtained in County Meath, supplementing data from collections in 2020 (Murray, 2020). The limitations to travel provided an opportunity to examine, curate and review specimens and slide preparations in collections from previous years. In the course of this undertaking material was examined in bulk collections of alcohol preserved imagines and pupal exuviae and also of some previously undetermined slide preparations. The specimens reviewed were in personal collections as well as in material collected by former students and colleagues in University College Dublin, including those from C. Dowling, G. Forde and B. P. Hayes. Distribution data is given here for 27 species of Chironomidae. Following the procedure in Murray (2012), records are given by county and physiographic hydrometric area (HA) along with details of location, six figure Irish Grid Reference and date of collection. The material examined provides new data on occurrence and distribution of species in Counties Cavan, Donegal, Kerry, Mayo and Meath in HAs 7, 8, 22, 25, 29, 32, 34, 36 and 38. Records are given for species in the subfamilies Tanypodinae (1 species), Orthocladiinae (11 species), Chironominae (15 species - Tribe Chironomini 8, Tribe Pseudochironomini, 1, Tribe Tanytarsini 6). The Chironomini species *Parachironomus tenuicaudatus* (Malloch, 1915) is reported for the first time in County Meath, HA7 and for the Eastern River Basin District while

the Tanytarsini species *Tanytarsus medius* Reiss & Fittkau, 1971 is reported as new for County Donegal and HA38.

Abbreviations

The following abbreviations are used: BPH - Brian Hayes; HA(s) - Hydrometric Area(s); leg. - collected by; Pe - pupal exuviae; RBD - River Basin District; ♂Im - adult male imago.

The records

Unless otherwise stated, records reported here are based on determinations by the author from pupal exuviae in personal collections or from specimens identified in collections supplied by colleagues and former students at University College Dublin.

Subfamily TANYPODINAE

***Procladius (Holotanypus) choreus* (Meigen, 1804)**

CAVAN: HA7 - Park River, Virginia (N591882), 18 December 1967.

This record is from a slide preparation, provisionally identified as “*Procladius* sp indet.”, that had been put aside. Following its identification as *Procladius choreus*, the record from 1967 now constitutes the earliest record of the species from the Park River at its inflow to Lough Ramor at Virginia since the only published record of the species at this site is from March 1968 based on identification of an adult ♂ caught on the wing (Murray, 1972).

WESTMEATH: HA25 - Lough Ennell, Tudenham shore (N415466), 1 July 1978.

There are two other records of adult ♂ *Procladius choreus* collected at Tudenham, from where it was first reported on 3 March 1966 (Murray, 1972) and later, by Gregory Forde, on an unspecified date in 1981 (Forde, 1985).

Subfamily ORTHOCLADIINAE

***Bryophaenocladus subvernalis* (Edwards, 1929)**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), 5 November 2020.

This is the second record from collections around Meadesbrook since swarming adults were caught by aerial net sweep on 12 November 2016 over the nearby grass lawn and reported in Murray and Ashe (2017).

***Chaetocladus (Chaetocladus) perennis* (Meigen, 1830)**

MEATH: HA8 - Lawn, Meadesbrook, Ashbourne (O040594), ♂Im, 25 February 2021.

This is the fifth record of the species from Meadesbrook from where it was first collected in May 2005 (Murray *et al.*, 2014). Three further records, from March 2016 and in April and November 2019 were documented in Murray (2019).

***Corynoneura celeripes* Winnertz, 1852**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), Pe and ♂Im, 11 November 2020.

There is one previous record of the species at this location from 10 November 2012 (Murray *et al.*, 2014).

***Cricotopus (Cricotopus) annulator* Goetghebuer, 1927**

WESTMEATH: HA25 - Lough Ennell, Tudenham shore (N415466), ♂Im, 29 June 1966.

This record is based on a slide preparation previously set aside and labelled as “*Cricotopus* sp indet.” This is the sole record of *Cricotopus* (*C.*) *annulator* from Lough Ennell and is a second record of the species for County Westmeath since it was reported from August 1973 at Lough Owel. It is also known from 11 other locations in HA25 (Murray *et al.*, 2014).

***Eukiefferiella minor* (Edwards, 1929)**

KERRY: HA22 - River Caragh, Lower Brida Valley (V740805), 28 January 1976, leg. C. Dowling.

This record is based on determination of the species from a slide preparation of pupal exuviae of assorted Orthocladinae by Colette Dowling from specimens obtained during the Caragh River Survey (Dowling *et al.*, 1981). This is the only record of the species from the River Caragh but there are eight other records from HA22 and nine in County Kerry (Murray *et al.*, 2014).

***Limnophyes minimus* (Meigen, 1818)**

MEATH: HA8 - Lawn, Meadesbrook, Ashbourne (O040594), ♂Im, 25 February 2021.

There is one previous record at this location, from 2 January 2013. It was also recorded at the nearby stream site at Meadesbrook in May 2005 (Murray *et al.*, 2014).

***Nanocladius (Nanocladius) rectinervis* (Kieffer, 1911)**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), 10 October and 5 November 2020.

There are four existing records of the species at this site, the first of which was in August 1999 (Murray *et al.*, 2014).

***Psectrocladius (Psectrocladius) limbatellus* (Holmgren, 1869)**

MEATH: HA7 - Animal drinking trough, Ardsallagh (N896635), Pe and ♂Im, 13 May 2021.

There are two previous records at this location from where it was first documented in April 2000 (Murray *et al.*, 2014) and later, in collections in June 2018, by Murray and O'Connor (2018). These are the only records from HA7 but there are records in HA8 on eight occasions between 1999 and 2020 from outdoor rainwater tanks around the author's home at Meadesbrook in County Meath. This species is typical of small water bodies including ponds, littoral regions of lakes and in man-made pools, water butts and animal drinking troughs.

***Rheocricotopus (Rheocricotopus) fuscipes* (Kieffer, 1909)**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), 10 October 2020.

There are records of this common species of rivers and streams from more than 100 locations in Ireland. It was recorded on five previous occasions at this site where it was first collected in May 1974 (Murray, 2016, 2020; Murray *et al.*, 2018).

***Synorthocladius semivirens* (Kieffer, 1909)**

CAVAN: HA36 - Lough Sillan, Shercock (H705067), 1971, leg. J. P. O'Connor.

This species is widespread in Ireland with records from some 420 locations (Murray *et al.*, 2018) including Lough Sillan from where, based on collections of pupal exuviae in April, June and September 2007, it was reported by Murray *et al.* (2014). The record from 1971 reported here was given by O'Connor and Bracken (1978) but was overlooked and regrettably omitted in the distribution data given by Murray *et al.* (2014).

***Tvetenia discoloripes* (Goetghebuer & Thienemann, 1936)**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), 10 October 2020, 1 January and 21 January 2021.

There are 12 previous records from this site at which it was first found on 31 May 1974 (Murray *et al.*, 2014, Murray, 2016, 2020). It would appear to be a multi voltine species, since specimens, either pupal exuviae or adult ♂ have been collected throughout the year.

Subfamily CHIRONOMINAE

Tribe Chironomini

***Chironomus (Chironomus) anthracinus* Zetterstedt, 1860**

GALWAY: HA29 - Lough Rea, Loughrea (M615154), ♂Im, 10 April 1987.

This constitutes the earliest record of the species from Lough Rea and is based on identification of adult specimens in an alcohol preserved bulk collection that had been given to the author by [†]Dr Martin O'Grady, former Senior Research Officer, Inland Fisheries Ireland. The sample was misplaced and had inadvertently remained unopened for 34 years until it was discovered during the present review. *Chironomus anthracinus* is already on record for Lough Rea from specimens collected and identified by P. H. Langton on 25 May 2003 (Murray *et al.*, 2015) but the record from specimens collected by O'Grady in 1987 is the earliest record of the species at this location.

***Chironomus (Chironomus) piger* Strenzke, 1956**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), 10 October 2020. There is a previous record of this species in 2012, also during the month of October, from a rainwater filled bucket at a nearby site at Meadesbrook (Murray *et al.*, 2015).

***Chironomus (Chironomus) riparius* Meigen, 1804**

MEATH: HA7 - Cattle drinking trough, Ardsallagh (N896635), 13 May 2021.

There is one previous record of this species at this location, obtained in the same month 16 years earlier, on 8 May 2005 (Murray *et al.*, 2015).

***Cryptochironomus psittacinus* (Meigen, 1830)**

WESTMEATH: HA25 - Lough Ennell, Tudenham shore (N415466), 1 July 1978.

This is the only record of the species from Lough Ennell and is based on identification of exuviae, overlooked in an alcohol preserved bulk collection, obtained in 1978. The species is known from 48 locations in Ireland, including a single record from County Westmeath at Lough Derravarragh in HA26 and two records in HA25 in Counties Offaly and Clare (Murray *et al.*, 2015, 2018).

***Demicryptochironomus (Demicryptochironomus) vulneratus* (Zetterstedt, 1838)**

MAYO: HA34 - Lough Conn, Brackwansha (G191098), 21 June 1965.

An unidentified slide preparation of the pupal exuviae of this species, labelled with location and collection date details only, was discovered during the present review. This specimen in the collection from June 1965 is the only record of the species in Lough Conn. However, there are records of the species from 14 locations in County Mayo and five in HA34, two of which, in 1995 and 2008, are at Drummin Wood along the northeast shore of the adjoining and interconnected Lough Cullin (Murray *et al.*, 2015).

***Endochironomus albipennis* (Meigen, 1830)**

WESTMEATH: HA25 - Lough Ennell, Tudenham (N415466), ♂Im 1 July 1978.

There are two earlier records of this species at Lough Ennell in June 1966 (Murray, 1972). It is a common species in lakes and is known from 114 locations in Ireland (Murray *et al.*, 2018). Records already exist from five locations in County Westmeath and from ten sites in HA25 (Murray *et al.*, 2015).

***Parachironomus tenuicaudatus* (Malloch, 1915) First record for County Meath, HA 7 and the Eastern River Basin District**

MEATH: HA7 - Attenuation pond number AP-SB/018MP 35.2, adjacent to M3 Motorway bridge over the River Boyne, Bellinter, Navan (N894625), Pe, 5 May 2021.

Parachironomus tenuicaudatus is currently known from 30 locations in 13 counties across 14 Hydrometric Areas in western, southern and central regions of the country (Murray *et al.*, 2015). It is thus far not on record in hydrometric areas of catchments comprising the River Basin Districts of the Eastern, North Eastern or Neagh Bann water resource management areas (Murray *et al.*, 2018). The record presented here, from pupal exuviae in a surface water net sweep along the margin of the attenuation pond, is the first record of the species in County Meath, in HA7 and in the Eastern RBD.

***Polypedilum (Polypedilum) nubeculosum* (Meigen, 1804)**

MEATH: HA7 - Animal drinking trough, Ardsallagh (N896635), 13 May 2021.

There is one previous record of this species at Ardsallagh based on adult males caught in an aerial net sweep beside the nearby River Boyne on 7 July 1988 at a distance of approximately 500m from the drinking trough (Murray *et al.*, 2015).

Tribe Pseudochironomini

***Pseudochironomus prasinatus* (Stæger, 1839)**

CAVAN: HA36 - Lough Sillan, Shercock (H705067), 1971.

This record is taken from the faunal list given by O'Connor and Bracken (1978) that was overlooked by Murray *et al.* (2015). This is the only record from Lough Sillan, however, the species is already known from three other locations in County Cavan and from nine locations in HA 36 (Murray *et al.*, 2015).

Tribe Tanytarsini

***Micropsectra apposita* (Walker, 1856)**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), Pe, 10 October 2020 and ♂Im 25 February 2021 from an aerial sweep net collection on the nearby lawn (O040594).

The species has been recorded at Meadesbrook on only two previous occasions, 2 April 1973 and 3 March 1996 (Murray *et al.*, 2015).

***Micropsectra atrofasciata* (Kieffer, 1911)**

MEATH: HA8 - Lawn, Meadesbrook, Ashbourne (O040594), ♂Im, 14 November 2020 in aerial sweep net collection adjacent to stream.

This is a very common species in Irish waters (Murray *et al.*, 2018) and there are now ten previous records at Meadesbrook from where it was first collected in June 1968 (Murray, 1972).

***Micropsectra notescens* (Walker, 1856)**

MEATH: HA8 - Stream, Meadesbrook, Ashbourne (O038594), 10 October 2020.

Pupal exuviae of this species were present in the same collection that contained *Micropsectra apposita* (above). There are now 11 records of *M. notescens* at Meadesbrook where it was first collected in March 1996 and most recently in May 2020 Murray (2020).

***Tanytarsus medius* Reiss & Fittkau, 1971 First for Donegal, HA 38 and the NW RBD**

DONEGAL: HA38 - Lough Dungloe (B783112), 12 August 1988, leg. BPH.

A mislaid slide preparation of this specimen, collected by B. P. Hayes (Hayes, 1991) and not identified at that time was located during the present review and positively identified. This is the first record of the species in County Donegal in HA38 and in the North Western River Basin District.

***Virgatanytarsus arduennensis* (Goetghebuer, 1922)**

GALWAY: HA32 - River Dawros, Tullywee Bridge, Letterfrack (L730586), Pe, 18 August 1981, leg. BPH.

The specimen on which this record is based is from recently discovered unidentified slide preparations by Hayes (1991). The species is known from two other locations in County Galway, one in the adjoining HA31 and one in HA26.

WESTMEATH: HA25 - Lough Ennell, Tudenham shore (N415466), ♂Im, 29 June 1966.

This record is derived from a previously undetermined slide preparation in personal collections. This is the only known record of the species from Lough Ennell. However a record exists from July 1973 at Lough Owel, some 5km north of Lough Ennell (Murray *et al.*, 2015).

***Virgatanytarsus triangularis* (Goetghebuer, 1928)**

MAYO: HA32 - Ashliegh Falls, River Erriff (L895645), pharate male pupa, 18 August 1988, leg. BPH.

Based on an undetermined slide preparation by Hayes (1991), discovered during the present review, this is the only record of the species from the River Erriff and is the third record of the species for County Mayo and HA32 (Murray *et al.*, 2015).

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IRISH CADDISFLY (TRICHOPTERA) RECORDS FROM NATIONAL RIVER AND LAKE MONITORING WORK IN 2021

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Abstract

Records are presented based on caddisflies (Trichoptera) taken randomly by HBF on Irish lakes and rivers during national Water Framework Directive monitoring surveys. These field collections have provided numerous new hectad and monad records which are reported here. New county records are also noted.

Key words: Trichoptera, caddisflies, Ireland, distribution, county records, Environmental Protection Agency.

Introduction

The Environmental Protection Agency conducts the national Water Framework Directive monitoring programme in Ireland (e.g. O'Boyle *et al.*, 2019) by which river and lake water quality and trends are assessed with respect to ecological criteria and to physico-chemical water quality standards. During routine sampling as part of this programme, HBF took the opportunity to collect caddisflies that he observed in the field. This material was later identified by the senior author. Specimens were determined using Malicky (2004) and Barnard and Ross (2012). Voucher material of the rarer species has been retained in the O'Connor collection. All the new records will be forwarded to the National Biodiversity Data Centre in Addendum 6 to the dataset "Caddisflies (Trichoptera) of Ireland" (O'Connor, 2020).

RHYACOPHILIDAE

***Rhyacophila dorsalis* (Curtis, 1834)**

GALWAY: Black River, Bridge at Kilshanvy (M3157), 2♂♂1♀ 12 August 2021. Finny River, south west of Finny (M0158), 1♂ 29 May 2021. Gortgarrow Stream, bridge west of Parkbaun (M5861), 1♀ 3 June 2021. Gowlabeg River, bridge south-west of Gowla (L8139), 1♂ 4 August 2021. Headford Stream, bridge at Lisheennageha (M2643), 1♂ 10 June 2021. Invermore River,

bridge downstream of Invermore Lough (L8939), 1♂ 4 August 2021. Knock River, bridge at Derryoughter (M1824), 2♂♂ 3 August 2021. Owenboliska River, bridge in Spidéal (M1222), 1♂1♀ 3 August 2021. Owenriff River, 1km downstream of Lough Agraftard (M0742), 1♀ 10 August 2021.

MAYO: Robe River, Hollymount Bridge (M2568), 1♂ 9 June 2021.

GLOSSOSOMATIDAE

Agapetus fuscipes Curtis, 1834

DUBLIN: Sluice River, Belfast Road Bridge (O1744), 5♂♂ 1 September 2021. Sluice River, Kinsealy Bridge (O2143), 8♂♂ 1 September 2021.

GALWAY: Abbert River, 400m upstream of the bridge at Sheeaun (M6033), 2♂♂ 8 June 2021. Abbert River, bridge at Bullaun (M4340), 10♂♂2♀♀ 8 June 2021. Abbert River, bridge upstream of Abbey Bridge (M5143) 5♀♀ 8 June 2021. Abbert River, Killaclogher Bridge (M5537), 3♀♀ 8 June 2021. Headford Stream, bridge at Lisheennageha (M2643), 3♂♂2♀♀ 10 June 2021. Nanny (Tuam) River, upstream of Weir Bridge (M4152), 4♂♂2♀♀ 31 May 2021. Glennamucka Stream, bridge downstream of the tributary from Lough Doo, 5♂♂1♀ 8 June 2021. Gortgarrow Stream, bridge west of Parkbaun (M5861), 4♂♂2♀♀ 3 June 2021. Grange (Galway) River, Cloonkeen Bridge (M5951), 2♂♂ 1 June 2021. Grange (Galway) River, bridge near Cloondahamper (M5551), 3♂♂ 1 June 2021. Grange (Galway) River, Grange Bridge (M4849), 1♂1♀ 1 June 2021. Levally Stream, bridge near Levally (M5452), 1♂1♀ 1 June 2021. Polleen River, bridge south of Kilroe East (M0922), 4♂♂1♀ 3 August 2021. Sinking River, bridge 3km upstream of Dunmore Bridge (M5262), 3♂♂1♀ 3 June 2021. Sinking River, bridge at Dunmore Castle (M5063), 5♂♂4♀♀ 3 June 2021. Yellow (Sinking) River (M5763), 8♂♂1♀ 3 June 2021.

MAYO: Dalgan River, Ballyhaunis Bridge (M4979), 1♂ 2 June 2021. Dalgan River, Culnacledha Bridge (M4771), 16♂♂ 2 June 2021. Dalgan River, Doonmacreena Bridge (M4367), 1♀ 2 June 2021. Lough Conn, bay south of Knockmore (G2208), 1♂1♀ 29 June 2021. Lough Carrowmore, Knocknascollop (F8328), 7♂♂ 23 June 2021. Lough Moher (L9777), 1♂ 16 June 2021.

ROSCOMMON: Cloonfad River, Blackford Bridge (M4971), 6♂♂2♀♀ 2 June 2021.

Agapetus ochripes Curtis, 1834

GALWAY: Black River, bridge in Shrulc (M2852), 1♀ 12 August 2021. Finny River, south west of Finny (M0158), 1♂ 29 May 2021. Grange (Galway) River, bridge near Cloondahamper (M5551), 1♂1♀ 1 June 2021. Grange (Galway) River, Grange Bridge (M4849), 2♂♂ 1 June 2021.

MAYO: Dalgan River, Doonmacreena Bridge (M4367), 1♂1♀ 2 June 2021.

***Glossosoma boltoni* Curtis, 1834**

GALWAY: Loughkip River, bridge upstream of Ballyquirke Lough (M2231), 1♀ 6 September 2021.

MAYO: Scardaun River, bridge at Scardaun (M3368), 2♀♀ 7 September 2021.

***Glossosoma conformis* Neboiss, 1963 New to County Galway**

GALWAY: Clare (Galway) River, Cloonmore Bridge (M4049), 1♀ 31 May 2021.

HYDROPTILIDAE

***Allotrichia pallicornis* (Eaton, 1873) New to County Mayo**

GALWAY: Clare (Galway) River, Cloonmore Bridge (M4049), 1♂ 31 May 2021. Clare (Galway) River, Cregmore Bridge (M4132), 1♀ 31 May 2021.

MAYO: Lough Cullin, Straid side - South shore (G2301), 1♂ 24 June 2021.

***Hydroptila angulata* Mosely, 1922**

GALWAY: Corrib River, Salmon Weir Bridge (M2925), 1♂ 6 September 2021. Owenriff River, 1km downstream of Lough Agraftard (M0742), 1♀ 10 August 2021.

***Hydroptila forcipata* (Eaton, 1873)**

GALWAY: Abbert River, Killaclogher Bridge (M5537), 1♂ 8 June 2021.

MAYO: Robe River, bridge in Crossboyne (M3371), 1♂ 9 June 2021. Robe River, Hollymount Bridge (M2568), 2♂♂ 9 June 2021.

***Hydroptila sparsa* Mosely, 1920**

GALWAY: Abbert River, Killaclogher Bridge (M5537), 2♂♂ 8 June 2021. Corrib River, Salmon Weir Bridge (M2925), 1♂ 6 September 2021.

There is only one previous record from County Galway. The species was taken in 1994 at Rosroe (Barrna-nOra) (L7541) by M. C. D. Speight (O'Connor and O'Connor, 2020).

MAYO: Robe River, bridge in Crossboyne (M3371), 4♂♂ 9 June 2021. Robe River, bridge east of Hollybrook House (M2872), 1♂ 9 June 2021. Robe River, Hollymount Bridge (M2568), 2♂♂ 9 June 2021. Robe River, north of Curragh (M1664), 1♂ 10 June 2021.

***Hydroptila vectis* Curtis, 1834**

GALWAY: Corrib River, Salmon Weir Bridge (M2925), 1♂ 6 September 2021.

This is only the second record for County Galway.

***Orthotrichia angustella* (McLachlan, 1865) New to County Galway**

GALWAY: Screeb River, upstream of Lough Ahalia North (L9740), 1♂ 4 August 2021.

This is the first record for the west of Ireland (O'Connor, 2021).

***Oxyethira frici* Klapálek, 1891**

GALWAY: Glengawbeg River, bridge upstream Agraftard lake (M0641), 1♀ 10 August 2021. Owenboliska River, upstream of Lough Boliska (M1228), 1♂2♀♀ 6 September 2021.

PHILOPOTAMIDAE

Chimarra marginata (Linnaeus, 1761)

GALWAY: Clare (Galway) River, bridge 1.5 km upstream of Milltown (M4163), 1♂ 31 May 2021; Clare (Galway) River, Ballygaddy Bridge (M4153), 1♀ 31 May 2021. Corrib River, Salmon Weir Bridge (M2925), 1♂ 6 September 2021. Headford Stream, bridge at Lisheennageha (M2643), 1♀ 10 June 2021. Invermore River, 0.4km downstream of Lough Bunnahask (L9040) 1♂1♀ 4 August 2021. Owenboliska River, bridge in Spidéal (M1222), 2♀♀ 3 August 2021. Owenwee River, 200m downstream of Tawnaghbeg Lough (M0146), 1♂ 10 August 2021.

Philopotamus montanus (Donovan, 1813)

GALWAY: Knock River, Bridge at Derryoughter (M1824), 3♂♂1♀ 3 August 2021. Loughkip River, bridge upstream of Ballyquirke Lough (M2231), 1♀ 6 September 2021.

KERRY: Coomeelan Stream, bridge at Drehydroughteragh (V9763), 1♂ 25 August 2021.

Wormaldia subnigra McLachlan, 1865

GALWAY: Cashla River, bridge upstream of Loch an Doirin (M0333), 3♂♂1♀ pupa 9 August 2021. Owenboliska River, bridge in Spidéal (M1222), 4♂♂1♀ 3 August 2021.

ECNOMIDAE

Ecnomus tenellus (Rambur, 1842)

MAYO: Lough Carra, Brownstown (M1970), 1♀ 16 July 2021. Lough Carra, north west shore (M1676), 1♂ 15 July 2021. Lough Carra, shore north of Portroyal (M1574), 2♂♂1♀ 15 July 2021. Lough Conn, Cloghans Bay (G2013), 1♂ 7 July 2021.

POLYCENTROPODIDAE

Cyrnus flavidus McLachlan, 1864

MAYO: Lough Beltra (M0797), 1♂ 17 June 2021.

Cyrnus trimaculatus (Curtis, 1834)

GALWAY: Ballyquirke River, railway bridge downstream of Ballyquirke Lough (M2332), 1♂1♀ 6 September 2021. Glengawbeg River, bridge upstream Agraftard lake (M0641), 5♂♂ 10 August 2021. Invermore River, bridge at Lough Aiggan/Acaringe (L8940), 1♂ 4 August 2021. Owenboliska River, bridge in Spidéal (M1222), 2♂♂ 3 August 2021.

LEITRIM: Lough Gill, point south-west of Dooroy Castle (G7834), 1♂ 20 July 2021.

MAYO: Lough Feeagh, Treanlaur Lodge (F9701), F9701 9 July 2021. Lough Mask, Inishowenlackboy (M1262), 1♀ 14 July 2021. Robe River, bridge east of Hollybrook House (M2872), 1♂ 9 June 2021.

***Holocentropus dubius* (Rambur, 1842) New to County Sligo**

MAYO: Lough Moher (L9777), 1♀ 16 June 2021.

SLIGO: Lough Arrow, Ballinafad Bay (G7808), 1♂ 6 July 2021.

***Holocentropus picicornis* (Stephens, 1836)**

MAYO: Washpool Lough (M2183), 2♂♂2♀♀ 30 June 2021.

***Neureclipsis bimaculata* (Linnaeus, 1758)**

GALWAY: Ballyquirke River, railway bridge downstream of Ballyquirke Lough (M2332), 5♂♂ 6 September 2021.

***Polycentropus flavomaculatus* (Pictet, 1834)**

GALWAY: Finny River, south west of Finny (M0158), 1♂ 29 May 2021. Glengawbeg River, bridge upstream Agraftard lake (M0641), 5♂♂ 10 August 2021. Grange (Galway) River, Grange Bridge (M4849), 2♂♂ 1 June 2021; Grange (Galway) River, Cahergal Bridge (M4747), 1♂ 1 June 2021. Knock River, bridge at Derryoughter (M1824), 7♂♂ 3 August 2021. Loughinch River, second bridge upstream of the Knock River (M1823), 2♂♂1♀ 3 August 2021. Nanny (Tuam) River, bridge south of Oakmount (M4552), 1♀ 1 June 2021. Owenboliska River, bridge downstream of Seecon Lake (M1034), 1♂ 11 August 2021. Owenwee River, 200m downstream of Tawnaghbeg Lough (M0146), 1♂ 10 August 2021. Screeb River, upstream of Lough Ahalia North (L9740), 1♂ 4 August 2021. Sinking River, bridge at Dunmore Castle (M5063), 1♂ 3 June 2021.

MAYO: Lough Carrowmore, Knocknascollop (F8328), 1♂ 23 June 2021. Lough Conn, Cloghans Bay (G2013), 9♂♂1♀ 7 July 2021. Lough Mask, Aghinish (M1467), 2♂♂ 12 July 2021. Robe River, Bridge in Crossboyne (M3371), 2♂♂ 9 June 2021.

ROSCOMMON: Cloonfad River, Blackford Bridge (M4971), 1♂ 2 June 2021.

***Polycentropus kingi* McLachlan, 1881**

GALWAY: Glengawbeg River, bridge upstream of Agraftard Lake (M0641), 3♂♂ 10 August 2021. Knockadoagh River, bridge north of Knockadoagh (M0129), 2♂♂ 9 August 2021. Owenwee River, 200m downstream of Tawnaghbeg Lough (M0146), 2♂♂ 10 August 2021.

PSYCHOMYIIDAE

***Lype phaeopa* (Stephens, 1836)**

GALWAY: Cong Canal, bridge at old Church in Cong (M1455), 1♂ 10 June 2021. Finny River, south west of Finny (M0158), 1♂ 29 May 2021. Gortgarrow Stream, bridge west of Parkbaun (M5861), 1♂ 3 June 2021. Levally Stream, bridge near Levally (M5452), 1♂ 1 June 2021.

MAYO: Robe River, north of Curragh (M1664), 1♂ 10 June 2021.

***Psychomyia fragilis* (Pictet, 1834)**

MAYO: Lough Conn, Cloghans Bay (G2013), 1♂ 7 July 2021. Lough Mask, Aghinish (M1467), 5♂♂ 12 July 2021. Lough Mask, Inishgleasty (M1159), 1♂ 14 July 2021. Lough Mask, Inishowenlackboy (M1262), 2♂♂ 14 July 2021.

***Psychomyia pusilla* (Pictet, 1834)**

MAYO: Robe River, Brickeen's Bridge (M4174), 1♂1♀ 9 June 2021.

***Tinodes waeneri* (Linnaeus, 1758)**

GALWAY: Black River, bridge in Shrule (M2852), 2♂♂ 12 August 2021. Gowlabeg River, bridge south-west of Gowla (L8139), 2♂♂2♀♀ 4 August 2021. Invermore River, bridge downstream of Invermore Lough (L8939), 1♂ 4 August 2021. Lough Nabrocky Stream, bridge east of Loughanillaun S. (L8540), 1♂ 4 August 2021. Loughinch River, second bridge upstream of Knock River (M1823), 4♂♂2♀♀ 3 August 2021. Screeb River, upstream of Lough Ahalia North (L9740), 2♂♂3♀♀ 4 August 2021.

MAYO: Lough Cullin, North shore (G2003), 1♂ 24 June 2021. Stream at Muingnahalloona (F8519), 2♂♂1♀ 23 June 2021. Stream at Croaghaun (F8418), 1♂ 23 June 2021.

SLIGO: Lough Gill, Hazelwood (G7133), 1♂ 20 July 2021.

HYDROPSYCHIDAE

***Hydropsyche angustipennis* (Curtis, 1834)**

MAYO: Robe River, Hollymount Bridge (M2568), 1♂ 9 June 2021.

***Hydropsyche pellucidula* (Curtis, 1834)**

GALWAY: Corrib River, Salmon Weir Bridge (M2925), 1♀ 6 September 2021.

MAYO: Robe River, bridge east of Hollybrook House (M2872), 1♂ 9 June 2021.

***Hydropsyche siltalai* Döhler, 1963**

GALWAY: Knock River, Bridge at Derryoughter (M1824), 1♂ 3 August 2021.

PHRYGANEIDAE

***Phryganea bipunctata* Retzius, 1783**

MAYO: Dalgan River, 2 km south-west of Ballyhaunis (M4878), 2♀♀ 2 June 2021. Lannagh (Castlebar Lough) (M1087), 1♀ 14 June 2021. Lough Carra, cape south of Cow Island (M1869), 1♀ 15 July 2021.

SLIGO: Lough Arrow, Ballinafad Bay (G7808), 1♂ 6 July 2021.

GOERIDAE

***Goera pilosa* (Fabricius, 1775)**

GALWAY: Lough Mask Upper (M0658), 7♂♂1♀ 13 July 2021.

MAYO: Lough Carrowmore, Knocknascollop (F8328), 2♂♂ 23 June 2021. Lough Conn, bay south of Knockmore (G2208), 2♂♂2♀♀ 29 June 2021. Lough Mask, Caher Pier (M1463), 1♂ 17 July 2021. Lough Mask, Cappaghduff (M0967), 1♂ 14 July 2021. Lough Mask, Derrypark (M0361), 1♀ 14 July 2021. Lough Mask, Saint's Island (M1058), 1♀ 14 July 2021. Robe River, Kilknock Bridge (M4173), 1♂ 9 June 2021.

SLIGO: Lough Arrow, Ballinafad Bay (G7808), 3♂♂1♀ 6 July 2021.

***Silo nigricornis* (Pictet, 1834) New to County Roscommon**

GALWAY: Finny River, south west of Finny (M0158), 1♂ 29 May 2021. Nanny (Tuam) River, upstream of Weir Bridge (M4152), 1♂ 31 May 2021. Grange (Galway) River, Cloonkeen Bridge (M5951), 4♂♂ 1 June 2021. Grange (Galway) River, bridge near Cloondahamper (M5551), 1♀ 1 June 2021. Grange (Galway) River, Grange Bridge (M4849), 1♀ 1 June 2021. Headford Stream, bridge at Lisheennageha (M2643), 2♂♂1♀ 10 June 2021. Levally Stream, bridge near Levally (M5452), 2♂♂ 1 June 2021. Sinking River, bridge 3km upstream of Dunmore Bridge (M5262), 1♂ 3 June 2021. Sinking River, bridge at Dunmore Castle (M5063), 1♂ 3 June 2021.

MAYO: Dalgan River, Culnacleha Bridge (M4771), 5♂♂ 2 June 2021. Dalgan River, Doonmacreena Bridge (M4367), 1♀ 2 June 2021. Scardaun River, bridge at Scardaun (M3368), 1♂ 7 September 2021.

ROSCOMMON: Cloonfad River, Blackford Bridge (M4971), 1♂ 2 June 2021.

***Silo pallipes* (Fabricius, 1781)**

MAYO: Lough Carrowmore, Knocknascollop (F8328), 5♂♂ 2♀♀ 23 June 2021.

LEPIDOSTOMATIDAE

***Crunoecia irrorata* (Curtis, 1834)**

GALWAY: Invermore River, bridge downstream of Invermore Lough (L8939), 1♀ 4 August 2021.

***Lepidostoma basale* (Kolenati, 1848) New to County Roscommon**

GALWAY: Clare (Galway) River, bridge 1.5km upstream of Milltown (M4163), 2♂♂ 31 May 2021. Sinking River, bridge 3km upstream of Dunmore Bridge (M5262), 1♂ 3 June 2021. Sinking River, bridge at Dunmore Castle (M5063), 1♀ 3 June 2021.

ROSCOMMON: Cloonfad River, Blackford Bridge (M4971), 1♂ 2 June 2021.

***Lepidostoma hirtum* (Fabricius, 1775)**

GALWAY: Crumlin River, Dr Chromghlinne (M0322), 1♀ 9 August 2021. Knock River, Bridge at Derryoughter (M1824), 2♂♂ 3 August 2021. Owenriff River, 1km downstream of Lough Agraftard (M0742), 1♀ 10 August 2021. Polleen River, bridge south of Kilroe East (M0922), 1♀ 3 August 2021.

MAYO: Lough Beltra (M0797), 1 ♀ 17 June 2021. Lough Carra, Brownstown (M1970), 1 ♀ 16 July 2021. Lough Mask, Tourmakeady (M1170), 1 ♀ 12 July 2021.

SLIGO: Lough Gill, Hazelwood (G7133), 1 ♀ 20 July 2021.

LIMNEPHILDAE

***Limnephilus auricula* Curtis, 1834**

GALWAY: Loughkip River, bridge upstream of Ballyquirke Lough (M2231), 1 ♀ 6 September 2021.

***Limnephilus flavicornis* (Fabricius, 1787)**

GALWAY: Headford Stream, bridge at Lisheennageha (M2643), 1 ♀ 10 June 2021.

***Limnephilus incisus* Curtis, 1834**

MAYO: Lough Beltra (M0797), 1 ♀ 17 June 2021.

***Limnephilus lunatus* Curtis, 1834**

GALWAY: Cregg River, south-west of Liscananaun (M3335), 1 ♀ 7 September 2021. Cregg River, bridge near Drumgriffin (M3537), 1 ♀ 7 September 2021.

MAYO: Robe River, bridge downstream of Castlemagarret (M3470), 1 ♂ 7 September 2021.

***Limnephilus marmoratus* Curtis, 1834**

MAYO: Lough Aille (M0780), 1 ♀ 22 June 2021.

ROSCOMMON: Grange (Lisheen) Lough (M9385), 1 ♀ 5 July 2021.

***Halesus radiatus* (Curtis, 1834)**

GALWAY: Cregg River, bridge near Drumgriffin (M3537), 2 ♂♂ 7 September 2021.

***Potamophylax latipennis* (Curtis, 1834)**

KERRY: Coomeelan stream, Ford (V9564), 1 ♂ 25 August 2021.

SERICOSTOMATIDAE

***Sericostoma personatum* (Spence, 1826)**

GALWAY: Headford Stream, bridge at Lisheennageha (M2643), 1 ♀ 10 June 2021.

MAYO: Lough Beltra (M0797), 1 ♀ 17 June 2021. Lough Carrowmore, Knocknascollop (F8328), 1 ♂ 3 ♀♀ 23 June 2021. Lough Conn, Cloghans Bay (G2013), 1 ♂ 7 July 2021. Lough Rea (M6115), 1 ♀ 21 June 2021.

SLIGO: Lough Arrow, Ballinafad Bay (G7808), 1 ♂ 2 ♀♀ 6 July 2021. Lough Gill, Hazelwood (G7133), 1 ♀ 20 July 2021.

BERAEIDAE

***Berea maurus* (Curtis, 1834)**

GALWAY: Lough Mask Upper, south-east shore (M0557), 1 ♂ 1 ♀ 13 July 2021.

There is only one previous record from County Galway. The species was taken in 1994 at Rosroe (Barrna-nOra) (L7541) by M. C. D. Speight (O'Connor and O'Connor, 2020).

***Beraea pullata* (Curtis, 1834)**

GALWAY: Grange (Galway) River, Grange Bridge (M4849), 2♂♂ 1 June 2021.

MAYO: Robe River, Brickeen's Bridge (M4174), 5♂♂ 9 June 2021.

ODONTOCERIDAE

***Odontocerum albicorne* (Scopoli, 1763)**

GALWAY: Loughinch River, second bridge upstream of the Knock River (M1823), 1♂2♀♀ 3 August 2021.

MOLANNIDAE

***Molanna albicans* (Zetterstedt, 1840)**

GALWAY: Lough Mask Upper (M0658), 2♂♂ 13 July 2021. Lough Mask Upper, south-east shore (M0557), 1♂ 13 July 2021. Lough Mask Upper, south-west shore (M0157), 1♀ 13 July 2021.

MAYO: Lannagh (Castlebar Lough) (M1087), 6♂♂2♀♀ 14 June 2021. Lough Carra, north-west shore (M1676), 1♀ 15 July 2021. Lough Carra, shore north of Portroyal (M1574), 1♀ 15 July 2021. Lough Conn, near Water Treatment Plant (G1716), 1♂ 8 July 2021. Lough Cullin, North shore (G2003), 5♂♂1♀ 24 June 2021. Lough Mask, Glenbeg East (M0460), 3♂♂1♀ 14 July 2021. Lough Mask, Illandawaur (M1169), 2♂♂ 14 July 2021. Lough Mask, Red Island (M0857), 3♂♂ 13 July 2021. Lough Mask, Saint's Island (M1058), 2♂♂1♀ 14 July 2021. Lough Mask, Shanvallychaill (M0461), 1♂ 14 July 2021. Washpool Lough (M2183), 4♀♀ 30 June 2021.

SLIGO: Lough Arrow, Ballinafad Bay (G7808), 3♂♂1♀ 6 July 2021. Lough Gill, shore at St Angela's College (G7534), 1♀ 20 July 2021.

LEPTOCERIDAE

***Athripsodes albifrons* (Linnaeus, 1758)**

GALWAY: Crumlin River, Dr Chromghlinne (M0322), 1♀ 9 August 2021. Gowlabeg River, bridge south-west of Gowla (L8139), 1♂ 4 August 2021. Invermore River, 0.4km downstream of Lough Bunnahask (L9040) 1♀ 4 August 2021. Polleen River, bridge south of Kilroe East (M0922), 1♀ 3 August 2021.

***Athripsodes aterrimus* (Stephens, 1836)**

GALWAY: Polleen River, bridge south of Kilroe East (M0922), 1♂ 3 August 2021.

MAYO: Lannagh (Castlebar Lough) (M1087), 3♂♂ 14 June 2021. Lough Ballin (L9988), 1♂2♀♀ 22 June 2021. Lough Carra, cape south of Cow Island (M1869), 1♂ 15 July 2021. Lough Carra, shore north of Portroyal (M1574), 2♂♂ 15 July 2021. Lough Carra, shore north of Rinneen (M1972), 2♂♂ 16 July 2021. Lough Conn, Cloghans Bay (G2013), 6♂♂5♀♀ 7 July 2021. Lough Conn, Inishcoe Point (G1515), 8♂♂ 8 July 2021. Lough Conn, near Water Treatment Plant (G1716), 1♂ 8 July 2021. Lough Cullin, North shore (G2003), 9♂♂ 24 June 2021. Lough Cullin, Straid side - South shore (G2301), 8♂♂ 24 June 2021. Lough Mask, Inishgleasty (M1159), 1♀ 14 July 2021. Lough Mask, Tourmakeady (M1170), 1♂ 12 July 2021. Washpool Lough (M2183), 4♂♂2♀♀ 30 June 2021.

ROSCOMMON: Grange (Lisheen) Lough (M9385), 2♂♂ 5 July 2021.

SLIGO: Lough Arrow, Ballinafad Bay (G7808), 4♂♂4♀♀ 6 July 2021.

***Athripsodes cinereus* (Curtis, 1834)**

GALWAY: Owenboliska River, upstream of Lough Boliska (M1228), 1♀ 6 September 2021. Owenriff River, downstream of the Sewage Treatment Works, Oughterard (M1243), 1♀ 11 August 2021. Terryland River, Salmon Weir Bridge (M2926), 1♂ 6 September 2021.

MAYO: Lough Carra, Brownstown (M1970), 1♀ 16 July 2021. Lough Carra, north-west shore (M1676), 1♂ 15 July 2021. Lough Carra, shore east of Kileeran (M1770), 1♀ 15 July 2021. Lough Carra, shore north of Portroyal (M1574), 1♂ 15 July 2021. Lough Carra, shore north of Rinneen (M1972), 1♂ 16 July 2021. Lough Cullin, North shore (G2003), 1♀ 24 June 2021.

***Ceraclea fulva* (Rambur, 1842)**

MAYO: Lough Conn, Cloghans Bay (G2013), 1♀ 7 July 2021.

***Ceraclea senilis* (Burmeister, 1839)**

MAYO: Lough Mask, Aghinish (M1467), 1♂ 12 July 2021. Lough Mask, Curlew Island (M1470), 5♂♂ 12 July 2021.

ROSCOMMON: Grange (Lisheen) Lough (M9385), 1♂ 5 July 2021.

***Mystacides azurea* (Linnaeus, 1761)**

GALWAY: Knockadoagh River, bridge north of Knockadoagh (M0129), 1♂1♀ 9 August 2021. Lough Nabrocky Stream, bridge east of Loughanillaun S. (L8540), 2♂♂1♀ 4 August 2021. Screeb River, upstream of Lough Ahalia North (L9740), 1♂4♀♀ 4 August 2021.

***Mystacides longicornis* (Linnaeus, 1758)**

MAYO: Lough Ballin (L9988), 5♂♂ 22 June 2021. Lough Aille (M0780), 1♂ 22 June 2021. Lough Carra, Brownstown (M1970), 1♂ 16 July 2021.

***Oecetis furva* (Rambur, 1842) New to County Roscommon**

MAYO: Lough Cullin, North shore (G2003), 1♂ 24 June 2021.

ROSCOMMON: Grange (Lisheen) Lough (M9385), 1♀ 5 July 2021.

***Oecetis lacustris* (Pictet, 1834)**

LEITRIM: Lough Gill, Point south-west of Dooroy Castle (G7834), 1 ♀ 20 July 2021.

MAYO: Lough Carra, bay at Moorhall (M1974), 1 ♂ 16 July 2021.

***Oecetis ochracea* (Curtis, 1825)**

MAYO: Lough Carra, shore at Annies (M1972), 1 ♂ 16 July 2021.

***Triaenodes bicolor* (Curtis, 1834)**

GALWAY: Invermore River, bridge at Lough Aiggan/Acaringe (L8940), 1 ♀ 4 August 2021.

MAYO: Lough Feeagh, Treanlaur Lodge (F9701), 1 ♀ 9 July 2021.

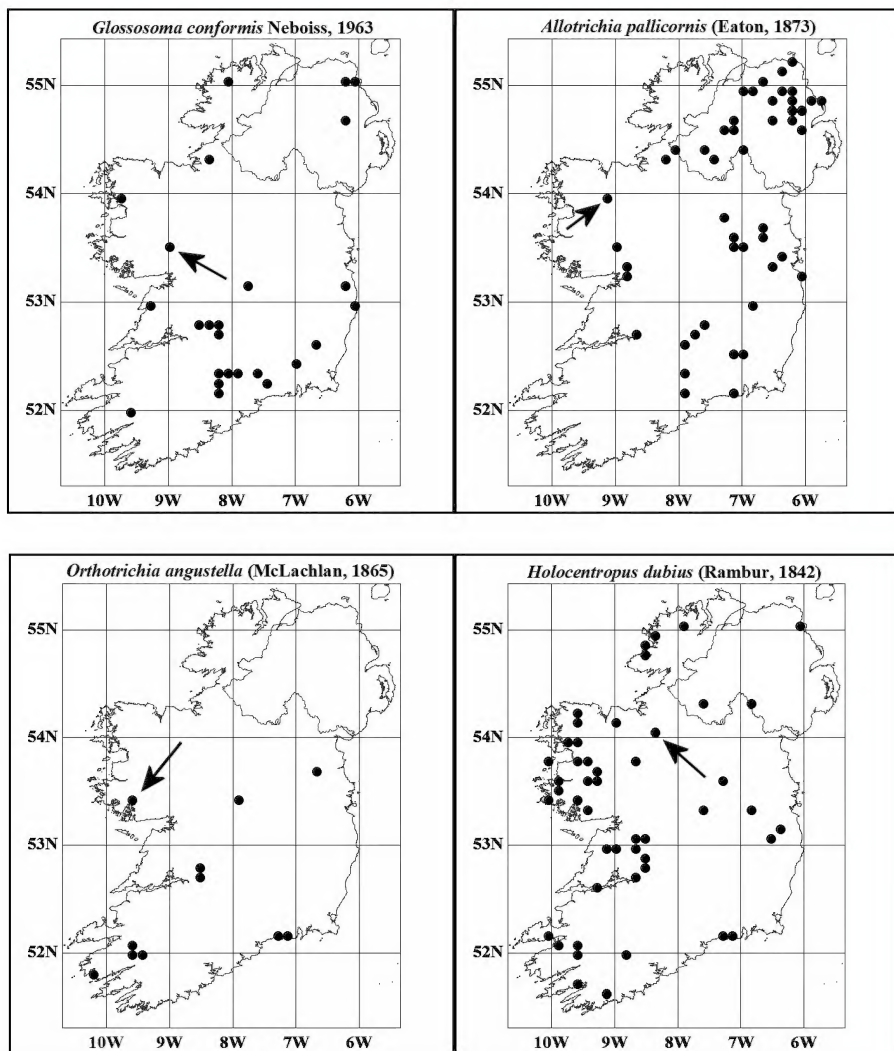
ROSCOMMON: Grange (Lisheen) Lough (M9385), 1 ♂ 5 July 2021.

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FIGURES 1-4. The known Irish distributions of *Glossosoma conformis* Neboiss, 1963, *Allotrichia pallicornis* (Eaton, 1873), *Orthotrichia angustella* (McLachlan, 1865) and *Holocentropus dubius* (Rambur, 1842). New county records are indicated by arrows.



PLATE 1. Two of the Irish lakes sampled in 2021. Top: Lough Mask, County Mayo. Bottom: Lough Gill, County Sligo. Photographs: Hugh Feeley.

BLISTER POD OR COJON DE BURRO *SACOGLOTTIS AMAZONICA* MART. (MALPIGHIALES: HUMIRIACEAE) DRIFT ENDOCARP STRANDED IN COUNTY CLARE ON THE ATLANTIC COAST OF WESTERN IRELAND, AND A REVIEW OF NW EUROPEAN RECORDS

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Abstract

During early December 2020, LMN discovered a drift endocarp of the Blister Pod or Cojon de Burro *Sacoglottis amazonica* Mart. measuring 40mm in length and 30mm in width stranded on Fanore Beach, Fanore Mor, County Clare (53.1196°N, 9.2882°W), on the Atlantic coast of western Ireland. The specimen represents the second record of *S. amazonica* from Irish maritime shores and the fourth from the NW European Atlantic.

Key words: Blister Pod, *Sacoglottis amazonica*, stranded drift-endocarp, Irish and NW European maritime shores.

Introduction

The Humiriaceae is a relatively small monophyletic flowering plant family within the order Malpighiales. The Humiriaceae contains eight genera (*Sacoglottis*, *Schistostemon*, *Humiriastrum*, *Humiria*, *Hylocarpa*, *Endopleura*, *Duckesia* and *Vantanea*), and circa 65 extant species (Cuatrecasas, 1961; Herrera *et al.*, 2010, 2014; Wurdack and Zartman, 2019).

The genus *Sacoglottis* currently includes 11 recognised extant species, ten of which are native to tropical South and Central America (*S. amazonica* Mart., *S. ceratocarpa* Ducke, *S. cydonioides* Cuatrec., *S. guianensis* Benth., *S. holdridgei* Cuatrec., *S. maguirei* Cuatrec., *S. mattogrossensis* Malme, *S. ovicarpa* Cuatrec., *S. perryi* K. Wurdack & Zartman, and *S. trichogyna* Cuatrec.), and one in tropical West Africa (*S. gabonensis* (Baill.) Urb.) (Anon., 2021a) which may have been naturally dispersed from South America across the Atlantic via the North Equatorial Current (Renner, 2004).

All of the Neotropical *Sacoglottis* species, except one (*S. holdridgei*) occur within hydrometric catchments draining into the Atlantic Ocean and/or Caribbean Sea. *S. holdridgei* appears to be confined to the Pacific side of Costa Rica and Ila del Coco (Cocos Island), circa 550km south-west of mainland Costa Rica. *S. ovicarpa* has been recorded on both the Pacific and Atlantic side of Panama (San Jose Island) and Columbia (Nariño and Valle del Cauca), and

from the Atlantic side of Nicaragua (Nueva Guinea, Cerro El Escobin), and southern Brazil (APA do Rio Pandeiros, Minas Gerais) (Johnston, 1949; Cuatrecasas, 1961; Anon., 2021b).

During early December 2020, LMN discovered a drift endocarp of *S. amazonica* measuring 40mm in length and 30mm in width stranded on Fanore Beach, Fanore Mor, County Clare (53.1196°N, 9.2882°W), on the Atlantic coast of western Ireland (Plates 1-2). The specimen represents the second record of *S. amazonica* from Irish maritime shores and the fourth from the NW European Atlantic.

Geographical distribution of *Sacoglottis amazonica*

Sacoglottis amazonica is a relatively small tree reaching up to 10m in height and is widely distributed in flooded forests of the Amazon basin, albeit chiefly its estuary. The tree has also been recorded, albeit disjunctly, from Costa Rica (Volcan Orosi), Panama, Columbia, Peru (Loreto), Ecuador (Sucumbios), Venezuela (Orinoco delta), Trinidad and Tobago, Guyana, and French Guiana (Ducke, 1922; Cuatrecasas, 1961; Nelson, 2000; Bernal *et al.*, 2019; Anon., 2021b).

Cuatrecasas (1961) stated that the tree was also found on some islands of the Lesser Antilles, and on the authority of Lansdown Guilding (1797-1831; see Howard and Howard, 1985), he specifically mentioned St Vincent. However, Morris (1895) had previously noted that Guilding's specimens of *S. amazonica* from St Vincent may have been collected in Trinidad whence many of the botanical specimens that he had donated to Kew Herbarium (London) had originated. *S. amazonica* was not included in the lists of specimens cultivated in St Vincent's Botanic Garden during 1773 (Howard, 1997-98), 1806 (Guilding, 1825), or presently (Anon., 2021c). Indeed, Acevedo-Rodriguez and Strong (2012) listed no representatives of either the genus *Sacoglottis* or family Humiriaceae established anywhere in the West Indies.

Fruits, endocarps and seeds of *Sacoglottis amazonica*

Sacoglottis amazonica produces oblong-ellipsoidal fruits (drupes), 50-60mm in length and 30-35mm in diameter. The exocarp is more or less smooth, coriaceous when dry, and 15-20mm thick. The light to dark brown or greyish endocarp is slightly and irregularly 10-sulcate and bullate, woody, filled with resinous cavities, the 5-locular ovum usually containing only one oblong seed (Morris, 1895; Hemsley, 1897; Cuatrecasas, 1961; Gunn *et al.*, 1999).

The tree producing the fruits and endocarps of *S. amazonica* was not positively identified for 290 years. A partly eroded endocarp from an unknown tree was first described and figured as an '*Exoticos fructus*' by Charles de L'Ecluse (also known as Clusius) in his *Exoticorum Libri Decem* published in 1605 (Plate 3 left). Forty five years later, Bauhino *et al.* (1650) reproduced L'Ecluse's figure and description under the name '*Fructus exotica cinereus*', and in 1662,

Jonston referred to the same specimen. Sloane (1696a, 1725) subsequently recorded having collected endocarps of '*Fructus exotica cinereus, cum lineris & tuberculis duris*' stranded on the coast of Jamaica. In 1767, Petriveri published a figure of a well-eroded endocarp (Plate 3 right), describing it as 'a hard oval fruit with seed holes round its surface, found on the shore of Jamaica'. In 1826, Martius provided the first detailed description of the tree (as *S. amazonica*) and its vegetative parts (but not the ripe fruits or endocarps) which were subsequently reproduced and figured by Urban (1877).

In 1884, Morris (1889) collected a number of unidentified endocarps stranded on the Palisadoes (Kingston Harbour, Jamaica) which were similar to those already described and figured by the previously mentioned authors. Morris (1889) also noted that an endocarp had recently been found stranded on the coast of Devon (UK) during November 1887 which was identical to the endocarps that both he and Sloane (1696a, 1725) had collected in Jamaica. Six years later, the fruits and endocarps were finally confirmed as belonging to *S. amazonica* following a comparison with previously unpublished detailed descriptions and figures of *S. amazonica* made by Herman Crüger in Trinidad during 1861 (Morris, 1895). It would appear that Crüger was unaware of the existence of *S. amazonica* in Trinidad until 1861 because he did not include the species in his Outline of the Flora of Trinidad published three years earlier (Crüger, 1858). Hemsley (1897) subsequently provided a detailed composite illustration of the vegetative and reproductive parts of *S. amazonica*, including the ripe fruit and endocarp (Plate 4).

Floation properties of *Sacoglottis amazonica* endocarps

The air-filled cavities (empty resin cysts) of *Sacoglottis amazonica* endocarps resemble blister-like protuberances on the surface which aid flotation for up to five years in sea water (Nelson, 1978, 2000; Thiel and Gutow, 2005; Perry and Dennis, 2010), long enough for at least some endocarps to drift from the Caribbean Region via the Antilles Current, Gulf Stream and North Atlantic Drift to NW Europe within the estimated minimum passive trans-Atlantic flotation time interval of 14 to 18 months (Quigley *et al.*, 2016).

Although there are numerous records of stranded drift endocarps of *S. amazonica* from the coasts of northern South America, Central America, Caribbean Region, Gulf of Mexico, and North America as far north as North Carolina (L'Ecluse, 1605; Sloane, 1696a, b, 1725; Hemsley, 1897; Morris, 1889, 1895; Cuatrecasas, 1961; Gunn, 1968; Gunn *et al.*, 1984, 1999; Gunn and Dennis, 1972, 1973; Zies, 1997; Dennis, 2000; Katz, 2001; Boykin, 2003; Sullivan, 2003, 2004; Foreman, 2004; Norton, 2007, 2008; Perry and Dennis, 2010; Witherington and Witherington, 2011, 2017; Anon., 2021b), it is strange that the species has not become naturally established northwards of Costa Rica or any of the offshore Caribbean Islands other than

Trinidad and Tobago (Guppy, 1917; Ridley, 1930; Acevedo-Rodriguez and Strong, 2012; Wurdack and Zartman, 2019). Guppy (1917) suggested that the seeds within drifting *S. amazonica* endocarps probably lose their germination capacity after six months. However, Gunn *et al.* (1999) noted that up to 30% of the endocarps stranded on the coasts of North and Central America contained viable seeds. According to Nelson (2000), *S. amazonica* requires tropical conditions, with a minimum temperature of about 12°C, and is killed by frost. Indeed, Gunn and Dennis (1973) noted that freezing temperatures prevented the establishment of *S. amazonica* on the northern coast of the Gulf of Mexico.

NW European records of stranded *Sacoglottis amazonica* endocarps

Despite their excellent floatation properties and numerous stranding records from the western Atlantic, there are only four records of stranded *Sacoglottis amazonica* endocarps from the European Atlantic, including two from western Ireland, one from the Orkneys, and one from Devon (Table 1). Indeed, the current specimen from County Clare represents the first record of *S. amazonica* from NW Europe over the last 130 years.

Although Nelson (1978, 1990, 2000) was sceptical about the authenticity of Sloane's (1696b, 1725) record (as *Fructus exoticus cinereus*) from the Orkneys c.1696, stating in 1990 that 'there is no account of it in Sloane's work', it is clear that Sloane was familiar with these unusual endocarps when Dr George Garden sent him the specimen from the Orkneys (Sloane, 1696b). Indeed, Sloane (1696a, 1725) had already collected identical stranded endocarps in Jamaica during the late 17th century which were deposited in the Sloane Collection (No. 1656) in the British Museum of Natural History (Morris, 1889, 1895).

Although Ridley (1930) stated that stranded endocarps of *S. amazonica* had been found on the coasts of the Azores, Guppy (1917) did not refer to any records from these mid-Atlantic islands.

Discussion

Nelson (2000) speculated that although stranded *Sacoglottis amazonica* drift endocarps are evidently very infrequent long-distance peregrine disseminules in NW European waters, it is possible that they are not collected by beachcombers because of their colour and uninteresting appearance, and are thus under-reported; perhaps just dismissed as walnuts which they superficially resemble (see Quigley *et al.*, 2016; Quigley and MacNamara, 2020).

It is possible that other species of *Sacoglottis* endocarps may occur in NW European waters and therefore all stranded endocarps should be critically examined. For example, endocarps of the single tropical West Africa species *S. gabonensis* have been recorded, albeit rarely, from the Gulf of Mexico (Van der Ham *et al.*, 2015). Although endocarps of *S. gabonensis* are

commonly found stranded along the coast of tropical West Africa (Cuatrecasas, 1961; Van der Burgt, 1998; Sullivan *et al.*, 2008), clearly some are carried across the Atlantic to South America via the South Equatorial Current and onwards via the Caribbean to the Gulf of Mexico.

Since 1976, ten distinctly furrowed endocarps resembling *Sacoglottis* sp. found stranded along the North Atlantic Ocean, including the Gulf of Mexico and the Dutch coast (North Sea) have so far eluded identification (Van der Ham *et al.*, 2015). Although the endocarps superficially resemble *S. amazonica*, they are larger and have deep furrows. The authors considered that the endocarps may represent an undescribed *Sacoglottis* species (provisionally denoted as *Sacoglottis* cf. *costata*) because it most closely resembles the fossil *S. costata* Reid recorded from Tertiary deposits in Columbia (NE South America).

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TABLE 1. NW European records of Blister Pod *Sacoglottis amazonica* drift endocarps.

1.	Date: c.1695. Location: Orkney Isles, N Scotland. Latitude (°N): c.58.9809. Longitude (°W): c.2.9605. Recorder: Dr George Garden. Voucher Material: unknown. Reference: Sloane (1696b, 1725).
2.	Date: November 1887. Location: Bigbury Bay, S Devon, SW UK. Latitude (°N): 50.2794. Longitude (°W): 3.8968. Recorder: Mrs Hubbard. Voucher Material: KEW Economic Botany Collection 67923. Reference: Morris (1889, 1895).
3.	Date: c.1890. Location: Bartragh Strand, Killala Bay, Co Mayo, W Ireland. Latitude (°N): 54.2140. Longitude (°W): 9.1630. Recorder: Miss Amy Warren. Voucher Material: not preserved. Reference: Colgan (1919).
4.	Date: early December 2020. Location: Fanore Beach, Fanore Mor, Co Clare, W Ireland. Latitude (°N): 53.1196. Longitude (°W): 9.2882. Recorder: Liam McNamara. Voucher Material: Liam MacNamara's private collection. Reference: this paper.



PLATE 1. Blister Pod (*Sacoglottis amazonica*) from County Clare. Lateral views. Photographs: Liam MacNamara.



PLATE 2. Blister Pod (*Sacoglottis amazonica*) from County Clare. Left: basal view. Right: apical view. Photographs: Liam MacNamara.

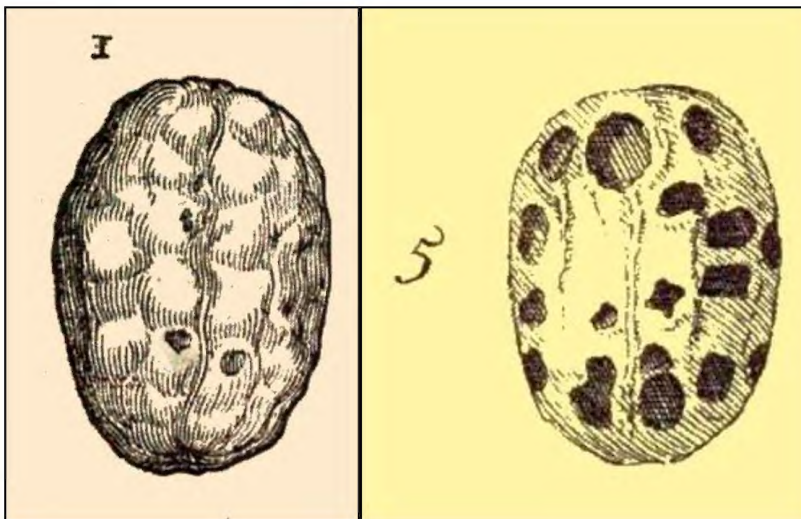


PLATE 3. Blister Pod (*Sacoglottis amazonica*) endocarp. Left: from L'Ecluse (1605). Right: from Petiveri (1767).

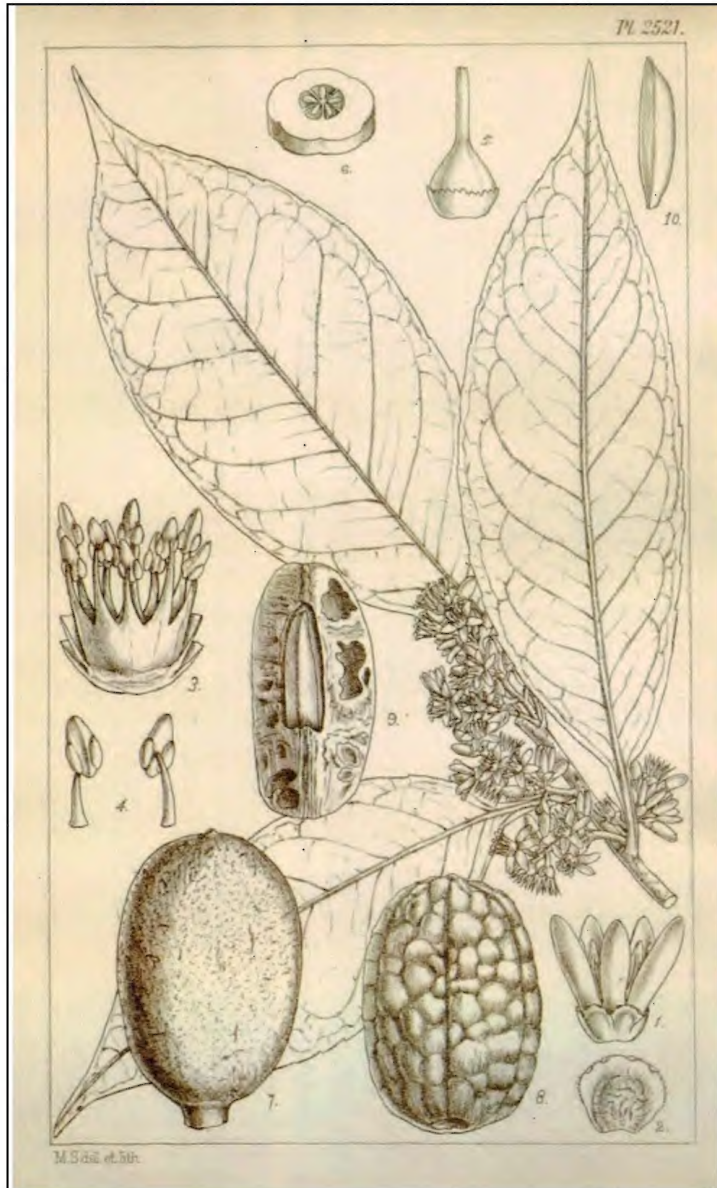


PLATE 4. *Sacoglottis amazonica* (after Hemsley, 1897).

THE FIRST IRISH RECORD OF *PORRHOMMA MICROPHTHALMUM* (O.P.-CAMBRIDGE) *SENSU STRICTO* (ARANEAE: LINYPHIIDAE)

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Abstract

The first verified Irish record of *Porrhomma microphthalmum* (O. P.-Cambridge, 1871) *sensu stricto* was collected in a pitfall trap set in an experimental site of spring oilseed rape (*Brassica napus*). The taxon has appeared previously in Irish publications but all these records have been misidentifications of other species from the genus. *P. microphthalmum* is strongly associated with the broken soils typical of cultivated cereal and arable crop habitats, however it can be found in a range of other environments.

Key words: *Porrhomma microphthalmum*, Linyphiidae, Araneae, spider, new, Ireland, arable crop, cereal crop, spring oilseed rape, *Brassica napus*.

Introduction

At a meeting of entomologists in 2019 co-hosted by The Royal Entomological Society, the National Museum of Ireland and Buglife - The Invertebrate Conservation Trust, and facilitated by the National Museum of Ireland in their main storage premises in Swords, County Dublin, Dr Dara Stanley, then leading a pollinator research group in University College Dublin (U.C.D.) <<https://suspoll.ucd.ie/>> mentioned that pitfall-trapping had been used in a study of arable crop associated invertebrates. Conversing later with Dr Stanley and Alison O'Reilly, a Ph.D. student working on this project, the senior author expressed an interest in potentially examining the spiders collected and subsequently a small amount of funding was found to facilitate the identification of a proportion of the specimens involved. Specimens had been collected and sorted by AOR and preserved in alcohol. MN identified a single male *Porrhomma* as *P. microphthalmum* (O. P.-Cambridge, 1871), a species which he had been expecting to see in Ireland for some time due to its close association with cultivated habitats and dispersal abilities. He was also aware that the taxon had previously appeared in Irish publications and that some

doubt still pertained to its Irish status.

Record

Porrhomma microphthalmum (O. P.-Cambridge, 1871) **New to Ireland**

KILDARE: Lyon's estate, U.C.D. experimental farm. Latitude 53°17'33.4" Longitude 6°31'35.6, Grid Reference N98287 27933. 1♂ collected in pitfall traps set between 27th June and 18th July 2019 at the edge of a plot of spring variety oilseed rape *Brassica napus* sown on 31st March 2019, determined MN. Traps were set as part of a research study examining insect communities (pollinators, pests and natural predators) across oilseed rape sites of various agricultural management intensity, part of a wider study run by Dr Dara Stanley of the Insect Ecology Laboratory, U.C.D. Pitfall traps were set and the catch sorted by AOR. The specimen has been retained in the senior author's collection.

Taxonomy

The most recent appearance of the taxon *Porrhomma microphthalmum* in an Irish context is in Helsdingen's literature survey (Helsdingen, 1996) where he placed a question mark against its Irish status. Helsdingen's statement that "all earlier records of this species subsequently have been referred to other species" is entirely accurate however the matter can be further clarified in order to address the doubt raised by the question mark, on the basis of which, for example, the species is noted as "doubtfully reported for Ireland" in a significant British online resource (Spider Recording Scheme, 2021).

The taxon was first noted from Ireland on basis of specimens collected in Marble Arch and Poulmagollum/Coolarkin caves, County Fermanagh, in July 1895 (Jameson, 1896) and subsequently on Lambay Island, County Dublin, in October, 1906 (Pack-Beresford, 1907) and Fenagh House, County Carlow, in the winter of 1908 (Jackson, 1908). A revision of the genus *Porrhomma* by A. R. Jackson (Jackson, 1913) included a re-examination of the above Irish specimens and showed they all belonged to *P. thorellii* Herman, 1879 which was subsequently shown to be a synonym of *P. convexum* (Westring, 1851). On basis of these corrections Pack-Beresford deleted *P. microphthalmum sensu stricto* from the Irish list (Pack-Beresford, 1920).

However, the name appeared again in 1974 when Hazelton included it in a review and checklist of the Irish hypogean (cave) fauna (Hazelton, 1974a, b, c). Her general survey paper (Hazelton, 1974a) could give the impression that *P. microphthalmum sensu stricto* is an acknowledged element of the Irish cave fauna, however, the list of records of cave invertebrates collected from 1952-1971 (Hazelton, 1974c) confirms that *P. microphthalmum* was not recorded from an Irish cave throughout that period, and thus that there were no Irish records of the taxon subsequent to those noted from 1895 to 1908 above. These older records were collated

in another paper (Hazelton, 1974b). Helsdingen (1996) is probably correct in suggesting that Hazelton was not aware of the taxonomic revisions involved and so overlooked the corrections.

Another synonym, *P. meadii* F. O. Pickard-Cambridge, 1894, was ‘accidentally’ published as Irish in 1909 (Pickard-Cambridge, 1909). The term accidentally is used because *P. meadii* had in fact been synonymised with *P. microphthalmum* (*P. convexum*) in 1895 by the author of *P. meadii* himself (F. O. Pickard-Cambridge, 1895). Carpenter noted the synonymy in his summary paper on Irish spiders (Carpenter, 1898) and Pack-Beresford noted it again in his 1920 paper. A specimen in the collection of the Natural History Museum, Dublin (NMINH) bears the details ‘*Porrhomma Thorelli* Herm / Fenagh *P. Meadii* OPC ARJ’ and has been confirmed by MN as *P. convexum*. Over a period of time, MN has had the opportunity to examine all specimens labelled *Porrhomma* in the NMINH collections and no specimens of *P. microphthalmum sensu stricto* have been seen.

As such it can be asserted unequivocally that all previous appearances in Irish publications of the taxon *P. microphthalmum* (and synonymies thereof) refer to *P. convexum* and that no specimens of *P. microphthalmum sensu stricto* seem to have been previously collected in Ireland.

Preferred environment

The spider seems to prefer open, relatively dry and well-draining habitats (Buchar and Růžička, 2002; Růžička, 2018) and is characteristic of agricultural and managed land-types across its range. It disperses by ballooning (Blandenier and Fürst, 1998), colonising broken and disturbed soils of various kinds, and making use of the semi-troglobytic microsites provided by the aerated interstitial cavities found in these situations. It is known to colonise newly formed polder, across which the spider’s numbers increased substantially over three years, eventually suggesting a preference for lightly vegetated rather than completely bare soils (Meijer, 1973, 1977). In the Czech Republic, it is known to colonise spoil heaps in early successional stages (Buchar and Růžička, 2002), in Slovenia was first recorded from agrarian meadow (Kostanjšek and Gorjan, 2013) and in Britain was not recorded in relatively large numbers until spiders were pitfall-trapped on arable land where it proved to be one of the more numerous linyphiid species collected (Thornhill, 1983; Spider Recording Scheme, 2021). It occurs in small numbers in a wide range of other habitats, appearing not infrequently in some e.g. mixed and deciduous woodlands in Britain (Spider Recording Scheme, 2021).

Distribution

Porrhomma microphthalmum was first described from Britain (O. P.-Cambridge, 1871) and was known to be widespread through southern and eastern England (and reaching into Scotland)

by 1939 (Bristowe, 1939) but was still considered a rare species even some years later (Locket and Millidge, 1953). Now known to be relatively common in some agricultural environments, it is found in Britain most abundantly in south-eastern areas of England, with few records from Wales or Scotland (Spider Recording Scheme, 2021). It occurs throughout a broad band of Europe but is absent from much of the Mediterranean, including Spain, Portugal and much of Greece (Nentwig *et al.*, 2021) and is recorded as far east as China.

In Britain, a maximum of males and females are found in May and June (Spider Recording Scheme, 2021) however across its European range adults can be found, at least in small numbers, at all times of the year (Nentwig *et al.*, 2021; Spider Recording Scheme, 2021). Blandenier and Fürst (1998) record dispersal maxima from July to the middle of August and from late September through to mid-December.

Irish status

We are aware of only two invertebrate publications detailing spiders from surveys of arable or cereal land in Ireland (Curry, 1976; Anderson *et al.*, 2008) and neither of these recorded *Porrhomma microphthalmum*. While it is difficult to know how long the species may have been in Ireland, it is obviously wholly improbable that the specimen noted here represents the only Irish occurrence. Given the availability of its preferred environment, it is likely that the species will be found more widely in Ireland in agricultural contexts and especially where cereal, arable and oil-crop cultivation is most widely practised.

Acknowledgments

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A THIRD COUNTY RECORD OF THE CADDISFLY *HAGENELLA CLATHRATA* (KOLENATI) (PHRYGANEIDAE: TRICHOPTERA) FROM IRELAND

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Abstract

Two females of the caddisfly *Hagenella clathrata* (Kolenati, 1848) were beaten from *Pinus* and *Ulex* in wet woodland marginal to Killaun Bog, County Offaly in 2021. The species was first recorded from Ireland only in 2016 and is now known from three Irish counties including the present one. The habitat where the specimens were found accords well with current understanding of the species' environmental preferences. A map shows the species' known Irish distribution.

Key words: *Hagenella clathrata*, Phryganeidae, Trichoptera, Window winged sedge, caddisfly, Ireland, Offaly, raised bog, marginal habitat, wet woodland.

Introduction

In late 2020 the author carried out a brief survey of spiders on Killaun Bog on foot of funding from Offaly County Council. A number of species of interest were recorded from the wet woodland that now dominates the lagg margin and it was recommended that this habitat should be examined more closely should a more extensive survey of the Killaun Bog be possible. Funding was found for 2021 to continue the survey work and an examination of uncut high bog, revegetating turbary, cutaway bog and the marginal lagg zone was carried out in the summer of 2021.

While other areas of the bog were examined using pitfall traps, these were deemed too difficult to set readily in some areas of the wet woodland (see below) so a range of other collecting techniques were utilised, primarily sweep-netting, hand-collecting and beating of canopy and scrub vegetation onto a ground-sheet.

A wide range of invertebrates other than spiders were collected by these methods, and having previously collected and identified some caddisflies, when a small number fell onto the ground sheet they were retained. Two specimens in particular were noted to have very distinctively and strongly marked wings and on closer examination were easily identified as *Hagenella clathrata* (Kolenati, 1848).

Record

Hagenella clathrata (Kolenati, 1848) New to County Offaly

OFFALY: Killaun Bog, Birr. Grid Reference N1086 0507. 2♀♀ collected on 24 June 2021. Both specimens were beaten from vegetation onto a ground-sheet, one from common gorse *Ulex europaeus*, the other from the lower canopy of Scots pine *Pinus sylvestris*. Another specimen was seen but it roused from the sheet very rapidly and flew away - the strongly patterned wings were however clearly visible.

Specimens were collected by the author and identified using Barnard and Ross (2012) including examination of the genitalia. The very strong fore-wing pattern – which gives the species its common name, the Window winged sedge – differed considerably from the photograph featured in Barnard and Ross (*op. cit.*), and somewhat between the two specimens collected (Plates 1 and 2) so genitalia should be checked in case of doubt. The known Irish distribution is shown (Fig. 1). Specimens have been retained in the author's collection.

Discussion

Gammell *et al.* (2018) and Wallace (2011) between them provide a considerable amount of information on the species' occurrence and habitat preferences in Britain and across Europe and repeating this information at any length here would be redundant. Wallace (2011) notes the considerable rarity of the species in the U.K. – the principal factor leading to it receiving BAP status. While this is only the third Irish hectad (10km²) for the species, Gammell *et al.* (2018) note that raised bog and associated habitats in Ireland have been relatively little investigated for their Trichoptera fauna. The first Irish specimens were collected from Counties Galway (three sites within the same hectad) and Laois (Gammell *et al.*, 2018; O'Connor, 2021), the locations consisting of a mosaic of bog habitats which, despite having been compromised anthropogenically, nevertheless, some degree of habitat continuity seems to have been preserved.

The species' ecology and favoured environment are characterised by Wallace (2011) as “the edges of lowland raised bogs, the edge of schwingmoors (quaking bogs), and wet heaths.” The presence of wet pools is vital, sometimes only inches across, and these are usually shallow and sometimes drying to sogginess in later summer. However, preferred pools are usually heavily shaded and the presence of grass tussocks, and especially *Molinia*, is important as the overhanging vegetation provides the requisite shaded conditions. Wallace notes that *Molinia* dominated wetlands and peatlands occur with some frequency in Britain and the rarity of the animal is thus something of a puzzle.

Wallace's characterisation (2011) of the preferred habitat matches very closely with some areas of habitat seen at Killaun Bog and it is of interest to consider whether the bog will

maintain populations of *Hagenella clathrata* into the future, in view of the extent to which the site has been managed for peat-harvesting. The greater area of the bog would currently almost certainly not facilitate the species as most of its surface consists of bare peat, the consequence of industrial harvesting. The remaining areas of re-vegetating bog were hand-harvested for peat up to c. 50 years ago and a 1.5-2m high face-bank marks the point at which cutting ceased. Turbary areas have been recolonised by a vegetation typical of raised bog i.e. *Calluna*, *Erica*, *Narthecium*, *Drosera* etc. The area that I surveyed in 2020 and 2021 lies at the southern end of the bog and splits relatively neatly into four zones, tiering north to south in the following order; unvegetated cutaway peat, high bog (uncut, though heavily drained), turbary and, wet woodland/lagg margin. The wet woodland envelopes the turbary area on its south, east and west margins. The ditch that separates the high bog from cutaway extends along an east-west axis, is relatively shallow, retains a small amount of water, and is as yet largely free of vegetation.

Deep pools at the base of the face-bank have almost completely infilled with *Sphagnum* mosses and areas of open water are small. The uncut high bog is, across most of its area, extremely dry. A number of shallow drainage ditches running across it are still evident. Throughout both the revegetating and uncut areas occasional small moist *Sphagnum* filled hollows can be found, though patches of actually open water are practically non-existent. It seems unlikely the few wet pools in these areas would be sufficient to facilitate the caddis.

The area where the specimens were found is a mosaic of wet woodland, *Ulex* and *Calluna* scrub and swampy *Molinia*; obviously closer to Wallace's description. The area is easily accessed by a walkway, and a new one was installed through 2021 to replace its decrepit wooden predecessor. Some areas of swampy *Molinia* grow adjacent to the walkway and these were inundated in autumn 2020 but largely dry – enough not to need wellies or waders – in the summer of 2021. A little further from the walkway are a relatively large number of pools of varying size and depth, the flooded remnants of peat-excavation holes. These can be a couple of metres across and a metre or more deep, though the water level remained, during the summer anyway, below ground-level. Some had emergent vegetation growing e.g. *Carex* species and Bulrush *Scirpus*. The edges of most were well shaded, sometimes completely hidden by grasses or *Calluna* and some had treacherously vertical walls. It was in this area that the specimens were collected. The combination of tall grasses and forb, scrub, trees and pools made negotiating this area quite difficult and the footing very unpredictable.

This area of the bog then accords very well with Wallace's description of *H. clathrata*'s preferred habitat. While the greater area of Killaun Bog will undoubtedly continue to drain of water and further desiccate it has been suggested that the southern areas of the bog, including the wet woodland described here, have a much better chance of continuing wet (John Feehan, pers. comm.). It is important to note that this area of the bog was acquired from Bord na Móna

by St Brendan's Community School, Birr some thirty years ago and is now managed for biodiversity and educational purposes and as such the general condition of the location will hopefully be monitored over time.

The presence of gravid females relatively high on vegetation growing beside the deepest, largest pools might suggest they were roosting prior to laying eggs locally. Wallace's account would suggest that the areas of soggy *Molinia* would be preferred for oviposition and larval stages than the deeper pools. The habitat, time of year and perhaps most especially the method of collection may assist in finding additional specimens at other sites.

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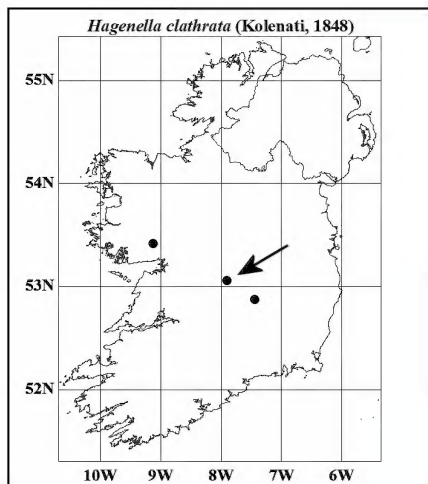


FIGURE 1. The known Irish distribution of *Hagenella clathrata* (Kolenati, 1848). The County Offaly record is indicated by an arrow.



PLATE 1. *Hagenella clathrata* ♀ from Killaun Bog, County Offaly, collected 24 June 2021 from common gorse *Ulex europaeus*. Photograph: Myles Nolan.



PLATE 2. *Hagenella clathrata* ♀ from Killaun Bog, County Offaly, collected 24 June 2021 from Scots pine *Pinus sylvestris*. Photograph: Myles Nolan.

RECORDS OF ADULT STONEFLY (PLECOPTERA) FROM IRELAND IN 2021, WITH OBSERVATIONS ON WING LENGTH AND WING CRUMPLING

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Abstract

Adult distribution records for 15 species of stoneflies (Plecoptera) taken randomly on lakes and rivers from March to September 2021, primarily from Counties Dublin, Galway, Kerry, Mayo and Wicklow, but records are also presented from Antrim, Kildare, Kilkenny, Offaly, Roscommon and Sligo. It is notable that the records from Antrim are the first adult records published for Northern Ireland in over 30 years. Records of brachyptery and microptery are also provided, as well as observations on wing crumpling and *Entomophthora* infection, where relevant.

Key words: Plecoptera, stoneflies, lakes, rivers, Ireland, Northern Ireland, wing length, wing crumpling, *Entomophthora* infection.

Introduction

During 2021 while in the field the authors took the opportunity to collect adult stoneflies from lake shores, streams and rivers from March to September. Records presented were primarily collected from Counties Dublin, Galway, Kerry, Mayo and Wicklow, but records are also presented from Counties Antrim, Kildare, Kilkenny, Offaly, Roscommon and Sligo. Specimens collected by Bryan Kennedy and Cathal McNaughton were forwarded to Hugh Feeley for identification. This paper presents records for 15 of the 19 extant Irish stoneflies species, and all stonefly families (Capniidae, Chloroperlidae, Leuctridae, Nemouridae, Perlidae, Perlodidae and Taeniopterygidae), confirmed in Ireland. A recent review and update of Irish

records of the nemourid *Protonemura praecox* (Morton, 1894) is available in Feeley (in press) and therefore, the 2021 records are not duplicated here. Three other species *Chloroperla tripunctata* (Scopoli, 1763), *Leuctra nigra* (Olivier, 1811) and *Nemoura avicularis* Morton, 1894 went unrecorded as adults by the authors in 2021. The latter two species are considered to have restricted distributions in Ireland (Feeley *et al.*, 2016). It is notable that records collected in Antrim by Cathal McNaughton are the first published adult stonefly records for Northern Ireland since those reported in the island-wide review by Costello (1988a). Similarly, the adult records of *Capnia atra* Morton, 1896, listed as Vulnerable in the recent IUCN red listing assessment (see Feeley *et al.*, 2020), and *Zwicknia bifrons* (Newman, 1839) are likewise the first published since Costello (1988a). Other notable records are highlighted within the text below.

Brachyptery, and the more severe microptery (i.e. very shortened or vestigial wings), in stoneflies is well known (e.g. Costello, 1988b; Feeley and Baars, 2020). In this paper all adults were fully winged (i.e. macropterous) and all male Perlidae were brachypterous unless otherwise stated. Similarly, Feeley and Macadam (2021) have highlighted the phenomenon of ‘crumpled wings’ in adult stoneflies, best described as an unsuccessful inflation of the wing or wings during the teneral adult stage (Plate 1). All observations in adults collected in 2021 are noted below. Observations of Entomophthora infection are also noted.

All specimens were identified using Hynes (1977). Nomenclature is based on Feeley *et al.* (2020). All records will be forwarded to the National Biodiversity Data Centre to update the dataset “Stoneflies (Plecoptera) of Ireland” (Feeley, 2021).

The records

CAPNIIDAE

***Capnia atra* Morton, 1896**

MAYO: Lough Conn, east shore (Mount Falcon) (G192096), 1♂ 24 April 2021, collected by B. Kennedy, identified by H. B. Feeley.

The individual collected exhibited brachyptery and wing crumpling (Plate 1).

SLIGO: Lough Easkey, lake shore (north) (G448237), 1♀ 16 April 2021, collected by B. Kennedy, identified by H. B. Feeley.

These are the first adult records of *Capnia atra* published in Ireland since Costello (1988a) and despite larval records for County Sligo (Feeley, 2021), this is the first published record of adult material. The individual collected exhibited brachyptery.

***Zwicknia bifrons* (Newman, 1839)**

MAYO: Lough Conn, east shore (Mount Falcon), 1♀ 24 April 2021, collected by B. Kennedy, identified by H. B. Feeley.

This is the first adult record of *Zwickyia bifrons* published in Ireland since Costello (1988a).

CHLOROPERLIDAE

Siphonoperla torrentium (Pictet, 1841)

DUBLIN: Owendoher River, Cruagh Road Bridge (O137227), 2♂♂ 25 April 2021 and 3♂♂ 11 May 2021, all H. B. Feeley.

KERRY: Galway's River, east of Incheens (V913790), 1♀ 20 July 2021. Galway's River, upstream of Cummeenshaun Lough (V925774), 1♀ 22 July 2021, all J-R. Baars.

KILKENNY: Tributary of Dinin River, Burn's Bridge (S595711), 2♂♂6♀♀ (2♀♀ crumpled wings) 15 May 2021, J-R. Baars.

MAYO: Beltra Lough, west shore (M086985), 2♀♀ 17 June 2021. Lough Carrowmore, lake shore at a slipway (near Knocknascollop) (F830283), 1♂1♀ 23 June 2021. Muingnahalloona Stream, bridge on N59 (F850193), 4♀♀ 23 June 2021. Lough Conn, east shore (Mount Falcon) (G192096), 1♀ 29 June 2021. Lough Mask, Inishowenlackboy (shore) (M128620), 1♀ 14 July 2021, all H. B. Feeley.

WICKLOW: River Liffey, Ballyward Bridge (O021160), 1♂3♀♀ 7 June 2021, J-R. Baars.

LEUCTRIDAE

Leuctra fusca (Linnaeus, 1758)

GALWAY: Knock River (Abhainn an Chnoic), bridge at Derryoughter (M186241), 1♀ 3 August 2021. Loughinch River (Abhainn Loch Inse), second bridge upstream of the Knock River (M189239), 10♂♂6♀♀ 3 August 2021. Owenboliska River, bridge in An Spidéal (M127222), 2♂♂ 3 August 2021. Gowlabeg River (Abhainn Ghabhla Beag), bridge south-west of Gowla (L815391), 2♂♂1♀ 4 August 2021. Cashla River, Cashla Bridge (L978264), 1♂1♀ 9 August 2021. Cashla River, bridge upstream of Loch an Doirin (M031332), 2♂♂4♀♀ 9 August 2021. Crumlin River (Abhainn Chromghlinne), Droichead na Chromghlinne (M039221), 8♂♂9♀♀ (1♀ crumpled wings) 9 August 2021. Knockadoagh River, bridge north of Knockadoagh (M010297), 6♂♂2♀♀ 9 August 2021. Owenriff (South Galway), bridge north-east of Knock South (M089225), 6♂♂2♀♀ 9 August 2021. Bunowen River, Glengowla Bridge (near Oughterard) (M083423), 4♂♂2♀♀ (1♀ crumpled wings) 10 August 2021. Glengawbeg, bridge upstream of Agraftard Lough (M067416), 13♂♂13♀♀ 10 August 2021. Owenriff River, 1km downstream of Agraftard Lough (M072420), 3♂♂1♀ 10 August 2021. Owenwee (Corrib), 200m downstream of Tawnaghbeg Lough (M014467), 4♂♂1♀ 10 August 2021. Owenboliska River, inflow of Seecon Lough (Galway Wind Park) (M080350), 8♂♂2♀♀ 11 August 2021. Owenboliska River, downstream of Seecon Lough (Galway Wind Park) (M108342), 8♂♂5♀♀ 11 August 2021. Owenboliska River, upstream of Lough Boliska (M121286), 8♂♂5♀♀ 6

September 2021. Cregg River, bridge near Drumgriffin (at the old Mill House) (M353378), 1♂1♀ 7 September 2021, all H. B. Feeley.

KERRY: Tributary of Galway's River, west of Ullauns (V914792), 1♂ 20 July 2021, J-R. Baars. Galway River's, east of Incheens (V913790), 25♂♂12♀♀ 20 July 2021, J-R. Baars. Tributary of Galway's River, downstream of Glas Lough (V905791), 27♂♂6♀♀ 21 July 2021, J-R. Baars. Coomeelan Stream, Drehidroutheragh Bridge (V973632), 2♀♀ 25 August 2021, H. B. Feeley. Coomeelan Stream, ford near Gearlan (V955644), 2♂♂3♀♀ 25 August 2021, H. B. Feeley. Cummeenshrule Stream, Priest's Leap (V984612), 2♂♂3♀♀ 25 August 2021, H. B. Feeley. Tributary of Galway's River, north of N71 on Kerry Way (V909806), 1♂9♀♀ 1 September 2021, J-R. Baars.

KILDARE: Rye Water River, downstream of Kellystown Lane (N985375), 1♀ 21 September 2021. Hartwell Stream, near Rathmore village (N973200), 2♀♀ 25 September. Hartwell Stream, near North of Johnstown (N925219), 1♀ 25 September 2021. Morell River, adjacent to Palmerstown Golf Course (N914222), 1♂1♀ 25 September 2021. Morell River, Tipper Road (N917188), 1♀ 25 September 2021, all J-R. Baars.

MAYO: River Robe, upstream of second bridge downstream of Castlemacgarrett (M345709), 3♂♂2♀♀ 7 September 2021. Scardaun Stream, bridge at Scardaun (M333680) 6♂♂3♀♀ 7 September 2021, all H. B. Feeley.

***Leuctra hippopus* Kempny, 1899**

DUBLIN: Glencullen River, Brockley Lane (O191194), 4♂♂5♀♀ 15 April 2021. Glencullen River, Boranaraltry Bridge (O168206), 1♂ 25 April 2021. Owendoher River, Cruagh Road Bridge (O137227), 1♂ 25 April 2021, all H. B. Feeley.

KERRY: Galway's River, east of Incheens (V913790), 4♀♀ 20 July 2021. Tributary of Galway's River, downstream of Glas Lough (V905791), 16♀♀ 21 July 2021, all J-R. Baars.

MAYO: Cong Canal, east bank near the monks fishing hut (Ashford Castle Estate) (M146550), 1♀ 10 June 2021, H. B. Feeley.

WICKLOW: Cloghoge Brook, bridge upstream of the Annamoe (Cloghoge) River confluence (O158060), 1♂ 13 April 2021. Avonmore River, south-east of the Sally Gap (O143099), 2♂♂2♀♀ 14 April 2021, all H. B. Feeley.

***Leuctra inermis* Kempny, 1899**

DUBLIN: Glencullen River, Boranaraltry Bridge (O168206), 2♂♂1♀ 25 April 2021. Owendoher River, Cruagh Road Bridge (O137227), 1♂2♀♀ 25 April 2021, all H. B. Feeley.

MAYO: Lough Carrowmore, lake shore at a slipway (near Knocknascollop) (F830283), 1♂1♀ 23 June 2021, H. B. Feeley.

WICKLOW: Avonmore River, south-east of the Sally Gap (O143099), 1♂2♀♀ 14 April 2021. River Liffey, 2km north-west of the Sally Gap (O109127), 3♂♂5♀♀ (1♂ crumpled wing and

1♀ with *Entomophthora* infection) 14 April 2021. Ballinagee River, Ballinagee Bridge (O036023), 5♂♂4♀♀ 15 April 2021. Ballydonnell Brook, Ballylow Bridge (O059130), 1♂ 15 April 2021. Ballylow Brook, bridge upstream of the Ballydonnell Brook confluence (O067133), 9♂♂4♀♀ (2♀♀ crumpled wings) 15 April 2021. Cock Brook, bridge north-west of Kilmore (O021088), 11♂♂7♀♀ 15 April 2021. Kings River (Liffey), bridge 100m upstream of the Ballinagee River confluence (O033020), 2♂♂2♀♀ 15 April 2021. Annaleeka Brook, Annaleeka Bridge (O055018), 1♂1♀ 16 April 2021. River Ow, Ballymanus Bridge (T092815), 1♂ 22 April 2021. River Ow, bridge near Aghavannagh Barracks (T055861), 2♂♂2♀♀ 22 April 2021, all H. B. Feeley.

NEMOURIDAE

Amphinemura sulcicollis (Stephens, 1836)

KERRY: Tributary of Galway's River, west of Ullauns (V914792), 9♂♂8♀♀ 20 July 2021. Galway's River, east of Incheens (V913790), 6♂♂6♀♀ 20 July 2021. Tributary of Galway's River, downstream of Glas Lough (V905791), 7♂♂20♀♀ 21 July 2021, all J-R. Baars.

MAYO: Lough Carrowmore, lake shore at a slipway (near Knocknascollop) (F830283), 3♂♂4♀♀ 23 June 2021, H. B. Feeley.

Nemoura cinerea (Retzius, 1783)

ANTRIM: Lough Natrosk, western reedbed (D272198), 3♂♂1♀ 2 April 2021 and 2♂♂1♀ 12 May 2021, collected by C. McNaughton, identified by H. B. Feeley.

MAYO: Lough Conn, east shore (Mount Falcon) (G192096), 1♂ 24 April 2021, collected by B. Kennedy, identified by H. B. Feeley. Lough Mask, Saints Island (shore) (M102586), 1♂ 14 July 2021, H. B. Feeley.

WICKLOW: Lough Bray Lower, lake shore opposite the main house (Lough Bray Lodge Estate) (O136163), 2♂♂ 14 April 2021, H. B. Feeley.

Nemurella pictetii Klapálek, 1900

ROSCOMMON: Cloonfad River, Blackford Bridge (M492710), 1♂ 2 June 2021, H. B. Feeley.

Previously only two larval records are available for *Nemurella pictetii* in County Roscommon reported by Callanan (2009) and listed in Feeley (2021). This is the first record of adult material for the county.

Protonemura meyeri (Pictet, 1841)

ANTRIM: Lough Natrosk, western reedbed (D272198), 1♀ 1 March 2021. Lough Garve, lake shore (D210176), 1♀ 25 April 2021, all collected by C. McNaughton, identified by H. B. Feeley.

DUBLIN: Glencullen River, Brockley Lane (O191194), 2♂♂1♀ 15 April 2021. Glencullen River, Boranaraltry Bridge (O168206), 1♂1♀ 25 April 2021, all H. B. Feeley.

GALWAY: Sinking River, bridge at Dunmore Castle (M500639), 2♀♀ 3 June 2021, all H. B. Feeley.

WICKLOW: Cloghoge Brook, bridge upstream of the Annamoe (Cloghoge) River confluence (O158060), 1♀ 13 April 2021. Avonmore River, southeast of the Sally Gap (O143099), 1♀ 14 April 2021. River Liffey, 2km northwest of the Sally Gap (O109127), 1♂1♀ 14 April 2021. Ballinagee River, Ballinagee Bridge (O036023), 1♀ 15 April 2021. Ballydonnell Brook, Ballylow Bridge (O059130), 1♂1♀ 15 April 2021. Ballylow Brook, bridge upstream of the Ballydonnell Brook confluence (O067133), 1♀ 15 April 2021. Cock Brook, bridge northwest of Kilmore (O021088), 3♂♂ 15 April 2021. Kings River (Liffey), bridge 100m upstream of the Ballinagee River confluence (O033020), 1♂3♀♀ 15 April 2021. Annalecka Brook, Annalecka Bridge (O055018), 1♂ 16 April 2021. Douglas River (Liffey), Granamore Bridge upstream of the Kings River confluence (N977030), 1♀ 16 April 2021. Glashaboy Brook, Glashaboy Brook Bridge east (O066016), 1♀ 16 April 2021. River Ow, bridge near Aghavannagh Barracks (T055861), 1♂1♀ (♂ with *Entomophthora* infection) 22 April 2021, all H. B. Feeley.

PERLIDAE

Dinocras cephalotes (Curtis, 1827)

OFFALY: Camcor River, ford 1.5km north of Kinnitty (N189066), 5♂♂3♀♀ (1♀ and 1♂ with crumpled wings) 27 May 2021, J-R. Baars.

Perla bipunctata Pictet, 1833

KILKENNY: Tributary of Dinin River, Burn's Bridge (S595711), 2♂♂2♀♀ 15 May 202 and 25♂♂18♀♀ (3♀♀ with crumpled wings) 26 May 2021. all J-R. Baars.

MAYO: Finny River, bridge south of the church in Finny (M010586), 2♂♂2♀♀ 30 May 2021, H. B. Feeley.

OFFALY: Camcor River, ford 1.5km north of Kinnitty (N189066), 19♂♂13♀♀ 27 May 2021, J-R. Baars.

WICKLOW: River Liffey, Ballyward Bridge (O021160), 14♂♂4♀♀ 7 June 2021, J-R. Baars.

PERLODIDAE

Diura bicaudata (Linnaeus, 1758)

MAYO: Lough Conn, east shore (Mount Falcon) (G192096), 7♂♂11♀♀ 29 June 2021. Lough Mask, Tourmakeady (shore north of Glensaul River inflow) (M107679), 1♀ 12 July 2021. Lough Mask, Tourmakeady (southwest shore) (M078637), 1♂1♀ 15 July 2021, all H. B. Feeley.

All females collected on these lake shores exhibited brachyptery, while males exhibited microptery (Plate 2). This contrasts with the macroptery in females and brachyptery in males recorded in lotic habitats in County Wicklow (Feeley and Baars, 2020).

***Isoperla grammatica* (Poda, 1761)**

DUBLIN: Owendoher River, Cruagh Road Bridge (O137227), 1♂ 11 May 2021, H. B. Feeley.

GALWAY: Grange River, Grange Bridge (M480499), 2♂♂2♀♀ 1 June 2021. Abbert River, bridge at Ballan (M436407), 2♂♂4♀♀ 8 June 2021. Glennamucka Stream, bridge downstream of the tributary from Lough Doo (M605348), 2♂♂ 8 June 2021. Headford River, bridge at Lisheennageha (M261431), 4♂♂6♀♀ 10 June 2021, all H. B. Feeley.

MAYO: Cong Canal, east bank near the monks fishing hut (Ashford Castle Estate) (M146550), 1♂4♀♀ 10 June 2021. Lough Carrowmore, lake shore at a slipway (near Knocknascollop) (F830283), 1♀ 23 June 2021, all H. B. Feeley.

ROSCOMMON: Cloonfad River, Blackford Bridge (M492710), 2♂♂ 2 June 2021, H. B. Feeley.

WICKLOW: River Liffey, Ballyward Bridge (O021160), 2♀♀ 7 June 2021, J-R. Baars.

TAENIOPTERYGIDAE

***Brachyptera risi* (Morton, 1896)**

DUBLIN: Glencullen River, Brockley Lane (O191194), 2♂♂1♀ 15 April 2021. Owendoher River, Cruagh Road Bridge (O137227), 1♂2♀♀ 25 April 2021. Owendoher River, Cruagh Mountain (O140217), 1♀ 25 April 2021, all H. B. Feeley.

WICKLOW: Avonmore River, bridge downstream of Lough Tay (Luggala Estate), (O161061), 1♀ 13 April 2021. River Liffey, bridge east of Ballysmuttan (O056148), 1♀ 14 April 2021. Ballinagee River, Ballinagee Bridge (O036023), 3♂♂ (1♂ crumpled wing) 15 April 2021. Ballydonnell Brook, Ballylow Bridge (O059130), 1♂ 15 April 2021. Ballylow Brook, bridge upstream of the Ballydonnell Brook confluence (O067133), 1♂1♀ 15 April 2021. Cock Brook, bridge northwest of Kilmore (O021088), 1♂ 15 April 2021. Kings River (Liffey), bridge 100m upstream of the Ballinagee River confluence (O033020), 1♂2♀♀ (1♀ crumpled wing) 15 April 2021. Annalecka Brook, Annalecka Bridge (O055018), 2♂♂ 16 April 2021. Glashaboy Brook, Glashaboy Brook Bridge east (O066016), 4♂3♀♀ 16 April 2021. Kings River (Liffey), Lockstown Bridge (N978034), 1♀ 16 April 2021. River Ow, bridge near Aghavannagh Barracks (T055861), 1♂2♀♀ 22 April 2021. River Ow, Ballymanus Bridge (T092815), 1♀ 22 April 2021, all H. B. Feeley.

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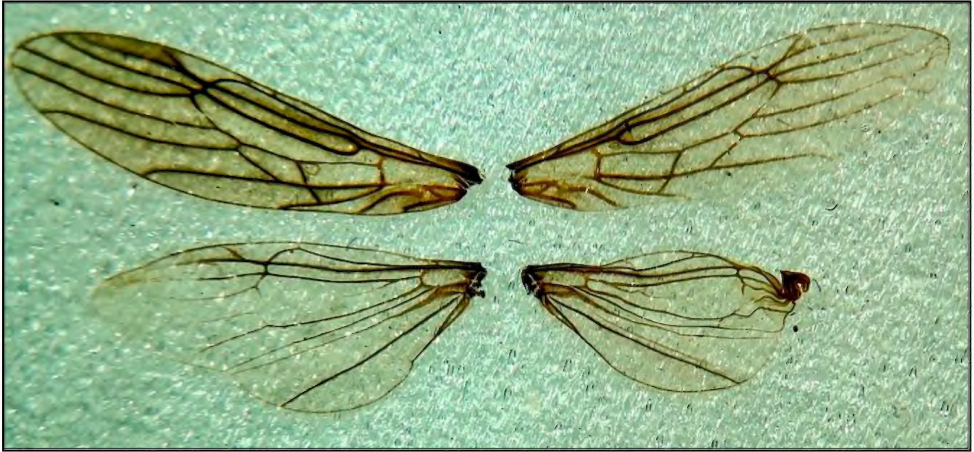


PLATE 1. Wing crumpling in *Capnia atra* Morton. Lough Conn, County Mayo, ♂ 24 April 2021. Photograph: Hugh B. Feeley.



PLATE 2. Adult male (top) and female (bottom) of *Diura bicaudata* (Linnaeus) exhibiting microptery and brachyptery, respectively. Lough Conn, 26 June 2021. Photograph: Hugh B. Feeley.

FIRST IRISH RECORD OF *MICARIA MICANS* (BLACKWALL) (ARANEAE, GNAPHOSIDAE) AND REVALIDATION OF *MICARIA PULICARIA* (SUNDEVALL)

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Abstract

A recent revision of *Micaria* species (Muster and Michalik, 2019) revived the taxon *Micaria micans* (Blackwall, 1858) and offered a morphological diagnosis differentiating it from its congener *M. pulicaria* (Sundevall, 1831). Both species were found to be present in Britain. An examination of previously collected Irish *Micaria* specimens in combination with fieldwork carried out in 2019 and 2020 shows that both species are present in Ireland. Thus *M. micans* can be added to the Irish list and *M. pulicaria sensu stricto* retained.

Keywords: *Micaria micans*, *Micaria pulicaria*, first Irish record, revived name, revalidated name, Carnsore point, Gibson spider collection, National Museum of Ireland – Natural History.

Introduction

Muster and Michalik (2019), in a revision of cryptic species of *Micaria* (Westring, 1851) utilising DNA and morphological analyses, showed that the taxon *M. pulicaria* (Sundevall, 1831) in fact represented two species, one of which, *Micaria micans* (Blackwall, 1858), had been synonymised with *M. pulicaria* some years ago (Reimoser, 1937). Apart from critical microscopic characters, the authors identified one gross somatic feature of *M. micans* which they suggest allows it to be readily distinguished from *M. pulicaria*; the presence of an elongate area of dark hairs or darkened integument on the dorsal surface of femur IV. Substantial differences in habitat preference were also observed between the two species with *M. micans* preferring insolated, drier habitats and especially coastal dune systems and *M. pulicaria* cooler, shaded, often inland habitats including woodlands and heathlands (Muster and Michalik, 2019). The femoral character has been tested, and found reliable, by Russell-Smith (2020) and Gallon (2021) on a larger sample of British specimens than Muster and Michalik (2019) were able to consider and the differences in habitat preference also evidenced.

M. pulicaria is the only representative of the genus known from Ireland so the question arose as to whether *M. micans* is also present here. Given the species' strong association with coastal dune systems, a good starting point with a view to answering that question was with specimens collected by Leslie Gibson from the dune system and coastal grasslands at Carnsore Point,

County Wexford, in the early 1980s (Gibson, 1982), and which are in the collections of the National Museum of Ireland - Natural History (Registration number NMINH:1987.16.108). The combination of the 'sunny south-east' location and the habitat involved suggested it might be a plausible location to find *M. micans*. The Gibson collection had been completely re-examined between 1999 and 2000 (Nolan, 2000) and all species segregated so the specimens were also readily accessible.

The dark femoral stripe was evident in some specimens placing them readily in *M. micans* and an examination of other diagnostic features confirmed the identification. Because all the Gibson specimens had been collected more than forty years previously however it was obviously of interest to ascertain whether populations persisted. On foot of this, two brief collecting visits were made to Carnsore Point, and the nearby Carne beach, County Wexford, on the 4th and 9th of September 2020 where additional specimens of *M. micans* were found. The question of the status of *M. pulicaria sensu stricto* in Ireland was resolved with a re-examination of some specimens collected from heathland on Howth Head, County Dublin, in 2019, and this showed that they belonged to *M. pulicaria sensu stricto*.

Records

Micaria micans (Blackwall, 1858) **New Irish record**

WEXFORD: dune systems at Carnsore Burrow and Carnsore point (Irish Grid Reference T10), 27 April-11 May 1980, 2♂♂ from pitfall traps on coastal grassland dominated by *Agrostis*, *Carex* and *Festuca*; 19-31 July 1980, 2♀♀ from pitfall traps on fixed *Ammophila* dunes. Specimens collected and identified by Leslie Gibson; same site (T096046), 4 September 2020, 1♀ immature, (T110040), 9 September 2020, 1♂, 1♀ submature. Specimens grubbed from amongst the base of *Ammophila* tussocks on low, fixed fore-dunes, collected and identified by Myles Nolan.

Micaria pulicaria (Sundevall, 1831) **revalidated for Ireland**

DUBLIN: Howth Head (O23), 13 September-2 October 2019, from pitfall trap set amongst *Pteridium* on heathland; 23 July-6 August 2019, 1♂ from pitfall trap set amongst *Ulex* on heathland. Traps were set and sorted by Nessa Darcy and spiders identified by Myles Nolan.

Discussion

The Gibson specimens could be placed very clearly in *Micaria micans* on basis of the dark dorso-femoral markings on leg IV which distinguished the males strongly (Plate 1) though females somewhat less so. Microscope examination of other features recommended by Muster and Michalik (2019) substantiated the identification. A sclerotised region on the retrolateral side of the palpal tegulum (males only) could be clearly seen to be strongly sinuous, creating a deep

and distinct notch (Plate 2). On the prolateral side of the male palp the position of the terminal curve of the embolus was measured, confirming that it lies within the basal half of the bulbus (see Figure 4 in Muster and Michalik, 2019). The epigyne of the female specimens displayed the strongly parallel, rather than curved, mid-section of the copulatory ducts i.e || rather than)((*sensu* Gallon, 2021), identifying them also as *M. micans*.

The three specimens collected at Carnsore on the 4th and 9th of September 2020 exhibited the dark dorso-femoral strip of hairs – the feature was visible on-site with a x10 hand lens - and the adult male displayed the other diagnostic factors detailed above.

As part of a study of the beetles of Howth Head in 2019, Nessa Darcy had utilised pitfall traps with spiders occurring inevitably as by-catch. Funding from Fingal County Council made it possible for me to identify these. Two specimens of *Micaria* had been collected and these both proved to be *M. pulicaria sensu stricto*. Clear dorso-femoral markings were not present (Plate 1), the retrolateral notch was shallow and rather indistinct (Plate 2), and the terminal curve of the embolus lay in the apical half of the palp's bulbus.

Comments

While many more Irish specimens of *Micaria* were available for examination, I have restricted this note to detailing a small number that satisfactorily represent the two taxa in question as described by Muster and Michalik (2019). I also wished to supplement observations on the Gibson material only with recently collected specimens, the reason for this being that while it was possible to place some other specimens examined into one or other of the species with certainty, a number of others seemed somewhat more ambiguous. Occasionally the male retrolateral notch seemed more strongly developed than one might expect in specimens that otherwise fit with *M. pulicaria*. The form of the copulatory ducts in many female specimens were often quite difficult to discern being partly obscured by other structures. The epigynes of specimens illustrated in Muster and Michalik (2019) had been cleared, revealing their differences more explicitly. This would probably be necessary in order to properly assess much of the female Irish material. The clarity of the internal female ducts in the Gibson Carnsore (1980s) specimens was almost certainly partially the result of mild bleaching the specimens had undergone due to overlong exposure to light prior to acquisition by the Museum.

Even the most obvious 'gross' feature, the dorso-femoral stripe on leg IV, seemed sometimes neither obviously present nor absent. Some rather hirsute male femora gave the impression of having a distinct elongate section of hairs amidst the pile, which could be possibly interpreted as an enlarged version of the *micans* 'stripe'. It was felt however this could also be an artefact of light refracting at different angles from the lateral leg facets, causing some hairs to appear paler than others and exaggerating the 'darkness' of those placed dorsally.

It should be emphasised here that Muster and Michalik (2019) in their morphological analysis made it clear that not all diagnostic structures supported identification of a single taxon at all times, and that consideration of a range of features might be necessary for at least a proportion of specimens. Thus, a detailed examination of a wider dataset of specimens will be necessary before making a statement on the species' relative distribution in Ireland.

An initial rapid review suggests that *M. micans* may be restricted to coastal dune systems and associated grasslands in the southern half of Ireland. However, there are few records from such habitats north of Drogheda, County Louth so it may not be possible to verify this as yet. The review also seems to confirm that *M. micans* does not occur inland, with any specimens from such locations seeming to be of *M. pulicaria*. Given its wider habitat latitude *M. pulicaria* will probably be found to occur countrywide in Ireland. The records from Howth show how 'coastal' the species can be without necessarily overlapping with *M. micans*. However, both species have been recorded from the same broad habitat in Wales (Gallon, 2021), though the extent of their overlap within a particular location is uncertain.

Acknowledgements

Thanks to Martin Cawley for examining the specimens of *Micaria* noted here (and some others) and for reading this note in an earlier draft. His opinion reinforced my hesitancy in treating of a wider dataset of material before a more careful analysis can be carried out. Thanks also to Hans Visser, Biodiversity Officer, Fingal County Council for funding the analysis of the Howth spiders collected by Nessa Darcy, to Adam Mantell for bringing the Muster and Michalik paper to my attention and to Nigel Monaghan for the use of laboratory facilities and access to the NMINH collections.

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PLATE 1. *Micaria micans* (left) (collected M. Nolan, Carnsore point, 2020) and *M. pulicaria* (right) (collected N. Darcy, Howth Head, 2019) showing the dorso-femoral dark stripe of leg IV (seen less clearly on leg III) in *M. micans* – arrowed – and the non-variegated pilosity on the femur of *M. pulicaria*. Photograph: Myles Nolan.



PLATE 2. *Micaria micans* (left) (collected M. Nolan, Carnsore point, 2020) and *M. pulicaria* (right) (collected N. Darcy, Howth Head, 2019) showing the retrolateral notch on the male palp (arrowed for *M. micans*). Photograph: Myles Nolan.

AN INDEXED BIBLIOGRAPHICAL CHECKLIST OF THE HARVESTMEN (ARACHNIDA: OPILIONES) OF IRELAND, 1836-2020

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Abstract

A bibliography relating to Ireland's harvestmen is presented which can be searched for species, vice-counties, habitats and some other topics.

Keywords: Arachnida, Opiliones, harvestmen, Ireland, bibliography, distribution, habitats.

Introduction

The following comprises a bibliography referring to the occurrence of harvestmen (Opiliones) in Ireland. The bibliography can be searched for species, vice-counties and some other topics. The opportunity is taken to provide an updated vice-county list for each species and to summarise offshore island records. The first published record for each species appears in **bold** print, with misidentifications and other errors indicated by being placed in brackets (). Synonyms which appear in the Irish literature are also included. Two articles (2 and 35), while not strictly relevant, are included for completeness sake.

Records contained in Templeton (1836), having been overlooked by all subsequent authors are included. These represent the first Irish records for harvestmen, and the first published records for *Phalangium opilio* (Linnaeus, 1758) and *Leiobunum rotundum* (Latreille, 1798) from these islands. Nine of the species listed cannot however be resolved with modern nomenclature, and some of these names are in any event question marked.

Of the nineteen species of harvestmen recorded from Ireland nine are widespread and common. These are *Nemastoma bimaculatum* (Fabricius, 1775), *Oligolophus tridens* (C. L. Koch, 1836), *Paroligolophus agrestis* (Meade, 1855), *Mitopus morio* (Fabricius, 1799), *Phalangium opilio* (Linnaeus, 1758), *Platybunus triangularis* (Herbst, 1799), *Leiobunum rotundum* (Latreille, 1798), *Leiobunum blackwalli* Meade, 1861 and *Nelima gothica* Lohmander, 1945. Six species, *Anelasmaocephalus cambridgei* (Westwood, 1874), *Oligolophus hanseni* (Krapelin, 1896), *Lacinius ephippiatus* (C. L. Koch, 1835), *Opilio saxatilis* C. L. Koch, 1839, *Opilio parietinus* (De Geer, 1778) and *Megabunus diadema* (Fabricius, 1779) also occur widely but are more local. There are few records for *Mitostoma chrysomelas* (Hermann, 1804), which is likely to be the most under-recorded species. The alien *Dicranopalpus ramosus* (Simon, 1909) has greatly expanded its range and is now widespread. Another alien *Odiellus*

spinosus (Bosc, 1792) persists in Sligo Docks in very small numbers. Only time will tell to what extent the last addition to the fauna, *Platybunus pinetorum* C. L. Koch, 1839 will increase its range here.

Irish vice-county records for harvestmen

I use the vice-county rather than county divisions following the approach of Pack-Beresford (1926). Since the publication of Cawley (2002) a fair number of new vice-county records have been generated, especially involving *Anelasmacephalus cambridgei* and *Dicranopalpus ramosus* but also *Oligolophus tridens*, *O. hanseni* (Krapelin, 1896), *Opilio saxatilis*, *Megabunus diadema* and *Nelima gothica*. Unpublished records are indicated in updated vice-county lists by appearing in **bold** print. A small number of published county records cannot be resolved to vice-county level, the most notable being *Mitostoma chrysomelas* from Co. Donegal Sankey (1951).

Irish offshore island records for harvestmen

Harvestmen have been recorded from 19 Irish offshore islands. These are Scariff, Valentia, Begenish, Inishvickillane, Great Blasket and Magherees (South Kerry), Cape Clear, Sherkin and Dursey (West Cork), Inishmore (vice-county Clare), Inishmacdara and Inishbofin (West Galway), Dalkey, Lambay and Ireland's Eye (Dublin). Caher and Clare Island (West Mayo), Inishmurray (Sligo) and Tory (West Donegal). I take Bristowe (1931) records from Degenish to refer to Begenish. Offshore island records are listed separately below under each species account.

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Index to the bibliography 1: species

NEMASTOMATIDAE

***Nemastoma bimaculatum* (Fabricius, 1775)**

Synonyms: *Nemastoma lugubre* C. L. Koch, 1836; *Phalangium bimaculatum* Fabricius, 1775

Irish bibliography: 6, 10, 12, 13, 15, 16, 20, 21, 22, 23, 25, 26, 28, 29, 30, 32, 37, 38, 39, 40, 43, 44, 45, 46, 50, 54, 55, 56, 58, 60, 68, 69, 70, 71, **74**.

***Nemastoma bimaculatum* var. *unicolor* Roewer, 1914**

Irish bibliography: **6**, 23, 26, 30.

Offshore island records: Inishvickillane, Cape Clear, Sherkin, Inishmore, Ireland's Eye, Lambay, Clare Island, Inishmurray, Tory.

Vice-county checklist: recorded from all Irish vice-counties, H01-H40.

***Mitostoma chrysomelas* (Hermann, 1804)**

Synonym: *Nemastoma chrysomelas* (Hermann, 1804)

Irish bibliography: 16, 23, 25, 26, 30, 31, 38, 39, 50, **58**, 67, 68, 69, 70.

Vice-county checklist: H01, H02, H06, H07, H10, H12, H13, H14, H20, H23 and H33.

TROGULIDAE

***Anelasmacephalus cambridgei* (Westwood, 1874)**

Irish bibliography: 25, 26, 27, 30, 38, 53, 65, **69**.

Vice-county checklist: H01-H06, H08-H10, H12, H14, H17, **H18**, H19-H22, H25-**H26**, H28, H30, H32, H34, H35.

PHALANGIIDAE

***Oligolophus tridens* (C. L. Koch, 1836)**

Synonym: *Acantholophus tridens* (C. L. Koch, 1836)

Irish bibliography: 6, 7, 12, 16, 18, 20, 21, 22, 23, 25, 26, 28, 29, 30, 38, 39, 44, 46, 50, 53, 54, 58, **60**, 68, 70.

Offshore island records: Lambay, Clare Island, Tory.

Vice-county checklist: **H30**. Now recorded from all Irish vice-counties, H01-H40.

***Oligolophus hansenii* (Krapelin, 1896)**

Irish bibliography: 16, 25, 26, 30, 38, 39, 46, **59**, 63, 67, 68, 70.

Vice-county checklist: H02, H08, H09, H11, H13, H15, H19, **H21**, H22, H23, H25, **H26**, H30, H32-H34, H36-H38 and H40.

***Paroligolophus agrestis* (Meade, 1855)**

Synonyms: *Acantholophus agrestis* Meade, 1855; *Oligolophus agrestis* Meade, 1855

Irish bibliography: 12, 16, **20**, 23, 24, 25, 26, 28, 29, 30, 37, 38, 39, 46, 50, 55, 58, 68, 70.

Offshore island records: Cape Clear, Sherkin, Inishmore, Clare Island, Tory.

Vice-county checklist: recorded from all Irish vice-counties, H01-H40.

***Lacinius ephippiatus* (C. L. Koch, 1835)**

Synonyms: *Acantholophus ephippiatus* C. L. Koch, 1835; *Oligolophus ephippiatus* C. L. Koch, 1835

Irish bibliography: **3**, 12, 16, 20, 25, 26, 28, 30, 34, 38, 39, 49, 50, 53, 55, 58, 68, 70, 71.

Offshore island records: Inishmore, Clare Island.

Vice-county checklist: H01, H03-H06, H08-H10, **H11**, **H12**, H13-H15, **H16**, H17, H18, H20, H21, H23, H25-H29, H32-H35 and H39.

***Odiellus spinosus* (Bosc, 1792)**

Irish bibliography: 26, **30**, 72.

Vice-county checklist: H28.

***Mitopus morio* (Fabricius, 1799)**

Synonyms: *Acantholophus morio* Fabricius, 1799; *Oligolophus morio* Simon, 1879

Irish bibliography: 8, 10, 11, 12, 15, 16, **18**, 20, 21, 22, 23, 25, 26, 28, 29, 30, 34, 38, 39, 40, 44, 46, 50, 54, 55, 57, 58, 68, 70, 71.

***Mitopus morio* var. *ericaeus* Jennings, 1982**

Synonyms: *Mitopus alpinus* Herbst, 1799; *Oligolophus alpinus* Herbst, 1799; *Oligolophus morio* var. *alpinus* Herbst, 1799

Irish bibliography: 8, 15, 16, 20, 23, 26, 30, 38, 39, 40, 54, 58, 68, **71**.

Offshore island records: Cape Clear, Dursey, Sherkin, Inishmore, Inishmacdara, Lambay, Caher, Clare Island, Tory.

Vice-county checklist: recorded from all Irish vice-counties, H01-H40.

***Phalangium opilio* (Linnaeus, 1758)**

Synonym: *Phalangium cornutum* De Geer, 1778

Irish bibliography: 1, 9, 12, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26, 28, 29, 30, 36, 37, 38, 39, 43, 44, 45, 46, 50, 54, 55, 58, 61, 68, 70, 73, **74**.

Offshore island records: Scariff, Beginish, Inishvickillane, Magherees, Cape Clear, Sherkin, Inishmore, Inishmacdara, Dalkey, Lambay, Clare Island, Inishmurray, Tory.

Vice-county checklist: recorded from all Irish vice-counties, H01-H40.

***Opilio parietinus* (De Geer, 1778)**

Synonym: *Phalangium parietinum* De Geer, 1778

Irish bibliography: **5**, 16, 23, 25, 26, 30, 38, 39, (50), 53, (55), 58, 66, 67, 68, 70, 72.

Vice-county checklist: H04-H08, H12, H13, H15-H17, H19-H23, H25, H28, H29, H33, and H35-H40.

***Opilio saxatilis* C. L. Koch, 1839**

Synonym: *Phalangium saxatilis* (C. L. Koch, 1839)

Irish bibliography: **4**, 16, 21, 23, 24, 25, 26, 30, 38, 39, 49, 50, 53, 58, 62, 66, 67, 68, 70.

Offshore island records: Sherkin.

Vice-county checklist: H01-H07, H09-H14, H18-H23, H25, H27, H28, H31, **H34**, and H38.

***Megabunus diadema* (Fabricius, 1779)**

Synonym: *Megabunus insignis* Meade, 1855

Irish bibliography: 12, 14, 15, 16, 20, 22, 23, 25, 26, 28, 29, 30, 38, 39, 43, 44, 45, 46, **47**, 50, 55, 56, 58, 60, 64, 68, 71.

Offshore island records: Inishmore, Inishmacdara, Inishbofin, Clare Island, (Aranmore).

Vice-county checklist: H01-H04, H06, H08-H21, H23, **H24**, H25-H39.

***Platybunus triangularis* (Herbst, 1799)**

Synonyms: *Platybunus corniger* Hermann, 1804, *Rilaena triangularis* (Herbst, 1799)

Irish bibliography: 12, 13, 15, 16, 20, 23, 25, 26, 28, 29, 30, 31, 32, 38, 39, 43, 44, 45, 46, 55, 58, **60**, 68, 69, 70.

Offshore island records: Scariff, Inishmore, Clare Island.

Vice-county checklist: recorded from all Irish vice-counties, H01-H40.

***Platybunus pinetorum* C. L. Koch, 1839**

Irish bibliography: **33**.

Vice-county checklist: H39.

LEIOBUNIDAE

***Dicranopalpus ramosus* (Simon, 1909)**

Irish bibliography: **24**, 25, 26, 28, 30, 38, 41, 46, 51, 52, 53, 72.

Offshore island records: As of yet not recorded from any offshore island.

Vice-county checklist: H01-H09, H11-H14, **H15**, H16, **H18**, **H19**, H20-H22, **H23**, H25, **H27**, H28, **H29**, **H30**, **H34**, H35, H39.

***Leiobunum rotundum* (Latreille, 1798)**

Synonym: *Phalangium rotundum* Latreille, 1798

Irish bibliography: 12, 14, 16, 18, 19, 20, 22, 23, 25, 26, 28, 29, 30, 38, 39, 44, 46, 50, 55, 58, 64, 68, 70, 71, **74**.

Offshore island records: Cape Clear, Sherkin, Inishmore, Inishmacdara, Lambay, Clare Island. Absent from Tory.

Vice-county checklist: recorded from all Irish vice-counties, H01-H40.

***Leiobunum blackwalli* Meade, 1861**

Irish bibliography: **7**, 12, 14, 15, 16, 20, 23, 24, 25, 26, 28, 30, 31, 38, 39, 42, 49, 50, 55, 58, 68, 70.

Offshore island records: Valentia, Cape Clear. Absent from Clare and Tory islands.

Vice-county checklist: recorded from all Irish vice-counties, H01-H40.

***Nelima gothica* Lohmander, 1945**

Synonym: *Nelima silvatica* (Simon, 1879)

Irish bibliography: 12, **16**, 17, 25, 26, 28, 29, 30, 31, 34, 38, 39, 49, 50, 53, 67, 68, 70.

Offshore island records: Great Blasket, Cape Clear, Sherkin, Inishmore, Clare Island, Inishmurray, Tory.

Vice-county checklist: recorded from all Irish vice-counties except H18 (Offaly), H37 (Armagh) and H40 (Derry).

Additional taxa mentioned in the literature

Phalangium annulipes

74.

Phalangium armatum

74.

***Phalangium hispidum* ? Hermann**

74.

***Phalangium longipes* ? Hermann**

74.

***Phalangium minutum* Meade, 1855**

48.

Phalangium nigripalpe

74.

Phalangium pusillum

74.

***Phalangium spinulosum* ? Hermann**

74.

***Phalangium tricuspidum* ? Dufour**

74.

Phalangium trispiniferum

74.

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West Cork (H03)

15, 16, 17, 25, 26, 27, 38, 39, 44, 51, 58, 68.

Mid Cork (H04)

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East Cork (H05)

25, 26, 38, 39, 51, 58, 68, 70.

Waterford (H06)

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South Tipperary (H07)

25, 26, 38, 39, 45, 51, 58, 68.

Limerick (H08)

16, 25, 26, 27, 38, 39, 51, 58, 68, 70.

Clare (H09)

16, 17, 18, 25, 26, 27, 38, 39, 43, 45, 46, 51, 58, 64, 66, 68, 70.

North Tipperary (H10)

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Kilkenny (H11)

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Carlow (H13)

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East Mayo (H26)

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16, 26, 30, 38, 39, 56, 58, 68, 70.

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Monaghan (H32)

16, 25, 26, 27, 38, 39, 58, 68, 70.

Fermanagh (H33)

16, 25, 26, 31, 38, 39, 58, 68, 70.

East Donegal (H34)

25, 26, 27, 38, 39, 58, 68, 70.

West Donegal (H35)

16, 25, 26, 27, 38, 39, 52, 54, 58, 68.

Tyrone (H36)

16, 25, 26, 38, 39, 58, 68, 70.

Armagh (H37)

16, 25, 26, 31, 38, 39, 58, 68, 70.

Down (H38)

9, 16, 25, 26, 38, 39, 42, 58, 68, 70.

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16, 25, 26, 31, 33, 38, 39, 51, 52, 58, 67, 68, 70.

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PSYCHODIDAE (DIPTERA) AS INDICATORS OF THE EFFECTS OF THE LINED KILDARE BYPASS MOTORWAY ON TUFA SPRING HABITAT AT POLLARDSTOWN FEN, IRELAND

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Dedication

Phil Withers (1954 - 2020) - a Dipterist of note (see tribute below).

Abstract

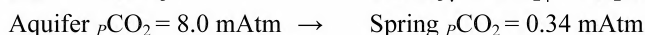
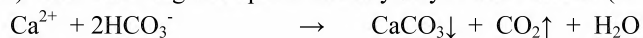
A baseline survey of tufa spring psychodids was carried out at tufaceous springs and flushes in Pollardstown Fen (Ireland) in 2001-2002, using four emergence traps/location at five locations. Monitoring was continued in 2003-2006 and, at one location, in 2017. There was no difference in the mean species occurrence per trap between the monitoring and baseline data, of the tufa habitat species *Pericoma calcilega* and *Paramormia decipiens*, indicating no effects of the road construction or operation on the sampled tufa spring and flush habitat. However, the most sensitive site, a high-level flush with tufaceous runnels in *Schoenus nigricans*-dominated vegetation, has not been monitored after 2006. Moss-expressed water levels (the water level in *Palustriella* moss when pressed by hand) was also monitored at all trapped locations, and this maybe the most efficient way to regularly monitor the tufa habitat, only using psychodid monitoring after low water levels are detected after dry periods.

Key words: *Pericoma*, Psychodidae, tufa springs, Pollardstown Fen, Kildare Bypass, Ireland, ecological impact assessment.

Introduction

Tufaceous springs (also classed as ambient-temperature hard water or petrifying (tufa) springs) are a habitat type of high conservation importance in Europe (Council of Europe, 2019; European Commission, 2013). The occurrence of tufa springs at Pollardstown Fen (County Kildare, Ireland) is one of the reasons for the designation of the fen as a Biogenetic Reserve and a Special Area of Conservation. Pollardstown Fen, as a whole, is fed by calcareous springs originating from the large Curragh sand and gravel aquifer (Kuczyńska, Johnston and Misstear, 2009). Tufa, a porous concretionary calcite rock, is formed by deposition from spring water oversaturated with calcium carbonate, often around the bases of calcicole mosses such as

Palustriella (= *Cratoneuron*) *commutata* (Hedw.) Ochyra, after degassing of carbon dioxide (Pentecost, 2005). The following example is cited by Boyer and Wheeler (1989):



This physical process can be enhanced by various photosynthetic, biochemical and microbiological processes (Cantonati *et al.*, 2016). The spring water at Pollardstown Fen has been recorded to have CaCO_3 concentrations up to 500mg/l (Reynolds, 2003).

In 2001, construction began on 13.2km of motorway to bypass the town of Kildare, 3.5km of which included a cutting into the Curragh aquifer to avoid impacts on the adjacent equine breeding sites (Coppinger *et al.*, 2002; Coppinger and Farrell, 2003). In order to also avoid impacts on the groundwater source for Pollardstown Fen, this section of the motorway was lined ('tanked') with a bituminous liner, so the road surface now lies down to 1.75m below the level of the surface of the aquifer (Coppinger *et al.*, 2002; Coppinger and Farrell, 2003).

Moth flies (Diptera: Psychodidae) include a range of species occurring in spring and seepage (flush) habitats (madicolous species), including specialists in springs (crenobiont species) and in tufa habitats (tufobiont species). Of the psychodid flies recorded from the Pollardstown tufa springs, the crenobiont *Atrichobrunnetia angustipennis* (Tonnoir) is a very rare species in Britain and otherwise only recorded in Belgium (Wagner, 2014); this is the only known site for this species in Ireland (Withers and O'Connor, 1992), and specimens collected here formed the basis for the first larval description for this species (Vaillant and Withers, 1990). The tufobiont *Pericoma calcilega* Feuerborn is local in Europe, and no other Irish records exist. The larvae, which have specialised dorsal setae on which calcite is deposited (Dürrenfeldt, 1978; see Fig. 1j in Cantonati *et al.*, 2016), were described by Vaillant and Withers (1993) from a sample from a Pollardstown Fen tufa spring. Like *Pericoma* species of the *calcilega*-group, *Paramormia* (= *Phyllotelmatoscopus*) *decipiens* (Eaton) is associated with lime-rich habitats, especially tufa (Vaillant, 1991), and a Pollardstown tufa spring was also the only Irish location from which it had been recorded, and from which larvae were described by Vaillant (1991). *Sycorax* species are also crenobiont psychodids (Vaillant, 1978; Omelková and Ježek, 2012), with *S. feuerborni* Jung only known from Pollardstown Fen in Great Britain and Ireland (Withers, 2002). A number of other rare insect species have been recorded from Pollardstown Fen springs and flushes such as the caddisfly *Limnephilus pati* O'Connor (O'Connor, Good and Wallace, 2019) although not all these are tufa specialists.

Small 'obscure' organisms like psychodid flies are rarely used in biodiversity monitoring often because of perceived difficulties with sampling and identification. The results of a monitoring study using tufa habitat psychodids is reported below, where the sampling design

was simplified so that it could be used by non-specialist entomologists (JG and TG), with initial input from a specialist (PW).

Methods

Sampling locations

A baseline survey of tufa spring psychodids was carried out at five locations in Pollardstown Fen in 2001–2002, and monitoring was continued at eight locations in 2003–2006 and, at one location, in 2017. The sampled locations and dates are listed in Table 1, and include a range of tufaceous springs and flushes, as well as non-tufaceous flushes. The main location sampled, the ‘Tufa spring’ (Plate 1), which was the location from which all the rare psychodids mentioned in the introduction were recorded, was a historically excavated spring where the excavation had penetrated down through the upper peat and clay layers (see Kuczyńska, Johnston and Misstear, 2009), resulting in an all-year-round flow of tufa-depositing water from the spring. This location is shown in Plate 1 as it was in 1989, although there has been considerable scrub growth on the margins in the meantime.

Details of the ‘Springbank flush’ (‘Site A’ of Kuczyńska and Moorkens (2010: Fig. 2)) are given in Kuczyńska, Johnston and Misstear (2009) and Kuczyńska and Moorkens (2010). It is an undrained natural location with superficial tufa deposits in runnels between *Schoenus* tussocks; data from 2001 were not collected due to difficulties with obtaining access.

The ‘*Schoenus* field’ (‘Site D’ of Kuczyńska and Moorkens (2010: Fig. 2)) had no visible surface tufa deposition and did not have *Palustriella commutata* present; the mosses *Campyllum stellatum* (Hedw.) Jensen and *Scorpidium cossonii* (Schimp.) Hedenäs occurred frequently (K. Duff, *in litt.*).

The ‘*Homalothecium* fen’ (‘Site C’ of Kuczyńska and Moorkens (2010: Fig. 2)) had only patchy *Schoenus* cover, with *Juncus subnodulosus* dominating a large proportion of the vegetation. Tufa deposition and *Palustriella commutata* were also absent. In contrast to the *Schoenus* field, the mosses *Calliergonella cuspidata* (Hedw.) Loeske and the rare *Tomenthypnum* (= *Homalothecium*) *nitens* (Hedw.) Loeske were more frequent (K. Duff, *in litt.*).

Emergence traps

Sets of four Owen emergence traps (Owen, 1989, 1992; see Plate 2), with their bases removed, were operated at various locations as summarised in Table 1, with the exception of Scarletstown drain and Springbank wood, where sets of only two traps were operated in 2003. The main sampling location, the Tufa spring, was sampled in all six years.

The emergence traps were made of white polyester mesh (the same material used in Malaise traps), with a standard Malaise trap collecting bottle, and covered a surface area of approximately 1.05m² (see Plate 2). The traps were originally obtained from Marris House Nets in Bournemouth, U.K., but are still available elsewhere commercially, although with a slightly smaller surface area. Traps were held in place by plastic tent pegs inserted into peat or granular tufa in peat, avoiding the pure tufa deposit wherever possible. Because of their size and the mosaic nature of the tufa shelves and peat soils, the Tufa spring traps also covered areas of fen peat vegetation but most of the cover was *Palustriella* moss.

Identification and nomenclature

Psychodidae from emergence traps in 2001 (Table 1) were determined by PW; indicator psychodids (Plate 3) from all other years were determined by JG, using the keys in Withers (1989) and Vaillant and Withers (1993), and reference material. Psychodid nomenclature follows Chandler, O'Connor and Nash (2008), with the exception of the two indicator species (see below); plant nomenclature follows Stace (1997) and Smith (2004). Reference specimens were retained in the Withers collection.

In 1993, Vaillant and Withers described specimens from Pollardstown Fen, recognised in Withers and O'Connor (1992) as *Pericoma tonnoiri* Vaillant, 1978, as *Pericoma calcilega* Feuerborn, 1923. Both species are tufobiont (Vaillant and Withers, 1993; Kvitte and Ivković, 2018). However, the species remains listed in the Irish checklist (Chandler *et al.*, 2008) as *Pericoma tonnoiri* Vaillant. In the current *Fauna Europaea* website (Wagner, 2014), *P. calcilega* is recorded from Great Britain, France and Germany but not south of Slovenia, whereas *P. tonnoiri* is recorded from Ireland, Great Britain and south-east Europe but not north of Austria. Although disjunct distributions are not without precedent in the *calcilega* subgroup of *Pericoma* (*P. pallida* is recorded from the south of Spain and the Czech Republic and Slovakia (Ježek and Omelková, 2012; Vaillant and Withers, 1993), but not from suitable habitats in France (Vaillant and Withers, 1993)), nevertheless they are highly unusual for Irish species. The senior author greatly regrets not clarifying this taxonomic question with Phil Withers before his untimely death, but, for the purposes of this paper, we have followed Vaillant and Withers (1993) and used the name *Pericoma calcilega* Feuerborn.

In 1991, Vaillant described specimens from Pollardstown Fen, recognised in Withers and O'Connor (1992) as *Paramormia decipiens* (Eaton, 1893), as *Phyllotelmatoscopus decipiens* (Eaton 1893). The European species of *Phyllotelmatoscopus* are restricted to calcium-rich and tufaceous springs, unlike the more eurytopic *Paramormia sensu stricto* (Vaillant, 1991; Wagner, 2006). However, there is disagreement whether *Phyllotelmatoscopus* should be of generic or

subgeneric status; the species remains listed in the Irish and British checklists (Chandler *et al.*, 2008; Chandler, 2021) as *Paramormia decipiens*, which we have followed here.

Water levels

Summer water levels in the sampled habitats were measured in 2003, 2004 and 2006; 2003 was the driest summer in the baseline period (2001-2003). The water level in the *Palustriella commutata* or other mosses was measured by pressing an opened hand with moderate pressure into the moss, and recording the level of water expressed, using the following four-point scale of 0 to 3:

0 - No expressed water visible (Plate 4a);

1 - Expressed water visible but not above interdigital skin folds of hand (Plate 4b);

2 - Expressed water visible above interdigital skin folds of hand but not covering fingers;

3 - Expressed water completely covering fingers (Plate 4c).

This was repeated 25 times in the wettest areas of moss, and the 25 values were added to give an index. For example: $0 \times 0 + 13 \times 1 + 9 \times 2 + 3 \times 3 = 40$. The index varied from 0 (no expressed water throughout) to 75 (expressed water completely covering fingers in all 25 presses).

This index was then used to represent what is referred to below as ‘moss-expressed water level’. On one occasion, at the Tufa spring in 2003, where water cress was attracting rats (*Rattus norvegicus* (Berkenhout)), water level samples were not taken due to the presence of rat faeces on the moss.

Results

The results of emergence trapping in 2001 for all Psychodidae are given in Table 2, and for the two tufa habitat indicator species *Paramormia decipiens* and *Pericoma calcilega* (Plate 3), for all years in Table 3. Both species occurred consistently in emergence traps at both the Tufa spring (six years) and at the Springbank flush with tufaceous runnels (four years) (Table 3). The mean occurrence per trap for these species never declined below 1.75 at both sites. Both species were also recorded at the same occurrence/trap at another flush in cut-away peat with more isolated small tufaceous runnels in 2006 (Entrance flush, Table 3). The rare *Atrichobrunettia angustipennis* was also recorded at the *Schoenus* field location, a new record for the north side of the Fen (Table 2).

Both the 2003 and 2004 (after construction), and 2006 and 2017 (after operation) data (Table 3) indicated no effect of the lined road on these two tufa habitat species, when compared to the baseline data.

The *Homalothecium* fen location, which had no tufa, had neither species in any trap (Table 2), as would be predicted if they were tufobiont. Interestingly, at Pollardstown ponds, the new tufa ledges which occurred between the two ponds created approximately 10 years earlier, also had neither species (Table 3), despite being colonised by *Palustriella commutata*.

However, *P. decipiens* did occur in two traps in the *Schoenus* field, which was calcareous but had no distinct tufa deposits. The soil surface of this location was not recorded as having dried in the late summer as was recorded at the *Homalothecium* fen. In contrast, *P. calcilega* occurred in all traps in the tufa ledges under woodland canopy at Springbank wood, whereas *P. decipiens* was absent from these habitats (Table 3). There was a similar pattern of occurrence at Scarletstown drain, in a tufaceous drain with moss, probably *Bryum pseudotriquetrum* (Hedw.) Gaertn., but without *Palustriella commutata*. However, the latter two locations only had data for two traps in one year.

Moss-expressed water level data for the driest summer (2003) of the three years 2001-2003 are given in Table 5. Data from 2004 and 2006 are given in Table 6. Only at the *Homalothecium* fen was there an indication of drying out (both 2004 and 2006 (Tables 5 and 6)), and this is also the only site where both tufa habitat indicator psychodids were absent (Table 3). Contrariwise, the lowest moss-expressed water level at the Springbank flush (21 on 9 August 2003 (Table 5)) preceded a psychodid (mean occurrence/trap) value of 2.0 the year after (2004) (Table 3).

Moss-expressed water levels were affected by recent rainfall, when pluvial water pools on the surface of the moss. For example, rainfall occurred during 3 August 2006, and moss water levels were recorded before rainfall at Springbank flush and the Entrance flush, and after rainfall at the *Schoenus* field. Moss-expressed water levels had decreased since July at the former two sites, but increased at the latter site (Table 6), correlating with the rainfall event. Also, subjective changes between dates in locating the boundaries of the monitored area may contribute to some variation in water level data.

Discussion

A simplified monitoring method, with mean occurrence/trap of two indicator species readily identifiable from male specimens in trap samples (see Plate 3), has given the following understanding of the impacts on tufa spring psychodids at Pollardstown Fen (see Table 3):

- (1) The consistent occurrence of both indicator species (*Pericoma calcilega* and *Paramormia decipiens*) year after year, in emergence trap samples at the most frequently monitored sites (Tufa spring and Springbank flush), indicates the reliability of the monitoring results;
- (2) Both species occurred in similar frequency in a deeper limnocrene spring with thick tufa (Tufa spring) and in shallower flushed runnels amongst *Schoenus*-dominated vegetation (Springbank flush and Entrance flush) with superficial calcite deposits (very localised at the

Entrance flush), which indicates that runnels were their more likely habitat before fen drainage, and that small patches of habitat can support both species;

(3) Both species were absent from a fen flush without tufa deposition (*Homalothecium* flush) and a tendency to occasionally dry out, indicating their dependency on a continually moist calcite-depositing environment, although *P. decipiens* can occur in calcareous fen soil without visible active tufa deposition (*Schoenus* field);

(4) Only one species (*P. calcilega*) occurred in traps from tufa ledges in drains under *Fraxinus* woodland canopy (Springbank Wood), indicating that *P. decipiens* may require open habitat;

(5) Both species were absent from a newly-formed tufa barrier with *Palustriella commutatum* in the open between two ponds (Pollardstown ponds), which could possibly be explained by lack of tolerance of higher temperatures.

(6) Both species occurred, although in lower frequency, in a drain (Scarletstown drain) with tufa deposition but with moss other than *Palustriella* (probably *Bryum pseudotriquetrum*, a species frequent in peat soil tufa seepages (Pentecost, 2005)).

(7) Some tolerance by both psychodid species of *summer* drying of habitat is indicated by the 2004 results from the Springbank flush, where moss-expressed water levels the previous summer were quite low (index = 21, see Table 5).

(8) Moss-expressed water level data must be collected and interpreted with care. Sampling after rainfall will confound results. Also, the lower values are more reliable for interpretation, as once water levels cover the fingers, the upper index threshold has been reached. Both these factors may explain why there was no significant correlation between moss-expressed water levels and recorded phreatic water levels (T. Gittings, unpublished data).

As with all major road projects, two types of impact, from construction (in this case temporary dewatering) and from operation (in this case liner failure), can be distinguished. The psychodid monitoring during the construction period did not reveal an impact from construction dewatering (2003-2004, Table 3). Neither did psychodid monitoring during operation reveal an impact (2006, 2017, Table 3), nor did moss-expressed water levels change significantly (the lowest value during 2006 being 49 (Table 6), well above the driest 2003 value of 21 (Table 5)).

The 2017 monitoring did not include the Springbank flush (due to time and access constraints), and a question remains concerning an impact at this location. A lowering of groundwater levels feeding the fen was detected near this site, and a contribution of the road construction to this lowering could not be ruled out (Kilroy *et al.*, 2009; Moorkens and Killeen, 2011; Johnston *et al.*, 2015). Nevertheless, the trapped tufaceous flushes were slightly downslope from the *Vertigo geyeri* Lindholm habitat monitored by Kuczyńska and Moorkens (2010), and potentially less susceptible to drying effects. No change in either psychodid or moss-expressed water levels were recorded here in 2006, but further monitoring would be

worthwhile, especially after the effects of recent droughts. Late summer droughts (e.g. 2018) may have less impact than late spring droughts (e.g. 2020) when the more susceptible larval stages occur.

There is also the long-term (measured in decades or centuries) question of deterioration of the bituminous liner, although this is unlikely as the liner is not exposed (one prediction of the lifetime of an unexposed HDPE liner is nearly 450 years (Koerner, Hsuan and Koerner, 2011)), and even exposed liners have shown no leakage after 30 - 40 years (Touze-Foltz and Farcass, 2017; Giroud and Gourc, 2014).

The question of trapping-out of adult *P. decipiens* and *P. calcilega*, due to the intensity of trapping (4 traps/location over several sequential years in a limited spatial habitat) did not arise as a potential confounding factor as there was no decline recorded in frequency of these species over the 2002-2004 period. However, from a conservation perspective, excessive trapping should be avoided. It is possible to reduce the trap size by one half if the back half of the netting is rolled up and clamps used for holding it in place (also the more recent commercially available traps cover a smaller area). Sampling over only one month instead of two is also a possibility, but from the results in Table 4, it is likely that this would reduce mean occurrence/trap to below 1.75. However, it is the consistency in results from year to year, rather than the total value that matters. An option is to discontinue further sampling if the first set of trap bottles contains all positive results; this would require field identification. Finally, there is the option of only carrying out trapping when the moss-expressed water levels are recorded to fall so much as to indicate temporary drying out of some of the moss or runnel surface. This requires water level monitoring in drought periods, especially in spring.

Cairns (1982) defined biological monitoring as “the systematic use of biological responses to evaluate changes in the environment *with the intent to use this information in a quality control program*” (italics added). Vegetation response is likely to be the preferred biological indicator for tufa habitat biological monitoring (Lyons and Kelly, 2016). However, the occasional use of specialised insects as supplementary indicators is worthwhile, if quality control refers to biodiversity as a whole.

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Tribute

This work would not have occurred without a chance encounter between Phil Withers and Jervis Good in 1989, and the mutual introduction to the wonders of Pollardstown Fen tufa springs and of psychodids. Shockingly, Phil died of a heart attack in July 2020 while on a collecting expedition in the Jura. Given his sense of humour, he would not have missed the chance of attributing this to the revenge of some insect (or better still some twentieth century entomologist reincarnated as such). Phil had a deep interest in the Irish fauna, and visited here regularly from the late 1970s to the early 2000s. He was great company, and was a brilliant entomologist whom it was a pleasure and a privilege to have known. Detailed obituaries have been published by Claude (2020) and Chandler *et al.* (2021).

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TABLE 1. Details of emergence trap sampling locations and dates for Psychodidae at Pollardstown Fen. Location names were devised for the purposes of this survey only.

Location (grid ref.)	Habitat	Sampling dates
Tufa spring (N77761526)	Tufaceous <i>Palustriella commutata</i> / <i>Carex acutiformis</i> or <i>Rorippa</i> <i>nasturtium-aquaticum</i> dominated spring	30 May – 25 July 2001 15 May – 27 July 2002 22 May – 31 July 2003 20 May - 29 July 2004 21 May - 24 July 2006 25 May - 26 July 2017
Springbank flush (N76421590)	Tufa runnels with <i>P. commutata</i> under <i>Schoenus nigricans</i> tussocks	15 May – 27 July 2002 22 May – 31 July 2003 20 May - 29 July 2004 21 May - 24 July 2006
<i>Schoenus</i> field (N77391662)	<i>Schoenus nigricans</i> / <i>Molinia</i> <i>caerulea</i> -dominated fen flush	5 June - 25 July 2001
<i>Homalothecium</i> fen (N77531632)	<i>Juncus subnodulosus</i> / <i>Schoenus</i> <i>nigricans</i> -dominated fen	5 June - 25 July 2001
Pollardstown ponds (N76211597)	Tufaceous <i>Palustriella commutata</i> spillway between two new ponds	15 May – 27 July 2002
Entrance flush (N77381543)	Tufaceous runnels between <i>Molinia</i> <i>caerulea</i> / <i>Schoenus nigricans</i> flush	21 May - 24 July 2006
Springbank wood (N76681579) (n = 2 traps)	Tufa spring under woodland canopy with <i>Palustriella commutata</i>	22 May – 31 July 2003
Scarletstown tufa drain (N77101678) (n = 2 traps)	Old tufaceous drain colonised by patches of moss (?- <i>Bryum pseudotriquetrum</i>)	22 May – 31 July 2003

TABLE 2. Occurrence/trap of Psychodidae (determined P. Withers) from emergence traps at three locations (see Table 1) in Pollardstown Fen in 2001 (n = 4 traps/location).

Species	Tufa spring	Schoenus field	Homalothecium fen
Tufobiont species			
<i>Paramormia decipiens</i> (Eaton)	4	2	-
<i>Pericoma calcilega</i> Feuerborn	4	-	-
Crenobiont species			
<i>Atrichobrunettia angustipennis</i> (Tonnoir)	1	1	-
<i>Sycorax feuerborni</i> Jung ♂	1	-	-
<i>Sycorax silacea</i> Haliday in Curtis ♂	-	1	-
Other species			
<i>Feuerborniella obscura</i> (Tonnoir)	-	2	1
<i>Panimerus albifacies</i> (Tonnoir)	4	4	4
<i>Panimerus denticulatus</i> Krek	2	1	-
<i>Panimerus maynei</i> (Tonnoir) / <i>goodi</i> Vaillant & Withers	3	4	4
<i>Pericoma fuliginosa</i> (Meigen)	2	-	-
<i>Pericoma nubila</i> (Meigen)	2	-	-
<i>Peripsychoda auriculata</i> (Haliday in Curtis)	2	1	-
<i>Psychoda albipennis</i> Zetterstedt	1	-	-
<i>Psychoda phalaenoides</i> (Linnaeus)	1	-	1
<i>Psychoda crassipennis</i> Tonnoir	1	-	-
<i>Telmatoscopus labeculosus</i> (Eaton)	1	1	2
<i>Threticus lucifugus</i> (Haliday in Walker)	3	-	-
<i>Tinearia lativentris</i> (Berdén)	-	-	1
<i>Tonnoiriella anchoriformis</i> Salamanna	-	-	1
<i>Tonnoiriella pulchra</i> (Eaton)	3	-	-

TABLE 3. Frequency of occurrence of ♂ tufobiont psychodids *Paramormia decipiens* and *Pericoma calcilega* in emergence traps. ‘Mean occ.’ = mean occurrence.

Location	Year	No. traps	<i>Paramormia decipiens</i>	<i>Pericoma calcilega</i>	Mean occ./trap
Tufa spring	2001	4	4	4	2.0
	2002	4	3	4	1.75
	2003	4	4	4	2.0
	2004	4	4	4	2.0
	2006	4	4	4	2.0
	2017	4	4	4	2.0
Springbank flush	2002	4	4	3	1.75
	2003	4	3	4	1.75
	2004	4	4	4	2.0
	2006	4	4	3	1.75
Entrance flush	2006	4	4	3	1.75
<i>Schoenus</i> field	2001	4	2	0	0.5
<i>Homalothecium</i> fen	2001	4	0	0	0.0
Pollardstown ponds	2002	4	0	0	0.0
Scarletstown drain	2003	2	1	2	1.5
Springbank wood	2003	2	0	2	1.0

TABLE 4. Frequency of occurrence of ♂ tufobiont psychodids *Paramormia decipiens* and *Pericoma calcilega* in individual emergence traps. Abbreviations: SW - southwest, SE - southeast, NW - northwest, NE - northeast, MW - mid-west, ME - mid-east.

Species		27 June 2002				30 June 2003			
Tufa spring		SW	SE	NW	NE	SW	SE	NW	NE
<i>Paramormia decipiens</i>		+	-	+	+	+	+	+	+
<i>Pericoma calcilega</i>		+	+	+	+	+	+	+	+
		27 July 2002							
		SW	SE	NW	NE				
<i>Paramormia decipiens</i>		+	+	+	+				
<i>Pericoma calcilega</i>		-	+	-	-				
Springbank flush		27 June 2002				30 June 2003			
		SW	SE	NW	NE	W	MW	ME	E
<i>Paramormia decipiens</i>		-	-	-	-	+	-	-	+
<i>Pericoma calcilega</i>		+	-	+	-	+	+	+	+

TABLE 5. Moss-expressed water levels (see methods) recorded from moss/soil surface at the emergence trap locations at emergence trap locations during late summer and autumn 2003, the driest baseline year for these seasons. Water levels were taken from 25 subsamples at each location, summarised as a cumulative index (see methods).

Location	Date		
	9 August	13 September	19 October
Tufa spring: north traps	40	n.d.	38
Tufa spring: south traps	60	n.d.	52
Tufa spring: untrapped areas	53	n.d.	46
Springbank flush	21	26	44
<i>Schoenus</i> field	22	29	44
<i>Homalothecium</i> fen	35	0	16
Springbank Wood	44	45	41
Scarletstown drain	70	n.d.	67

TABLE 6. Moss-expressed water levels indices (see methods) recorded from moss/soil surface at the emergence trap locations at several locations during summer 2004 and 2006.

Location	Date			
2004	5 June	26 June	17 July	29 July
Tufa spring (north traps)	73	75	75	75
Tufa spring (untrapped tufa)	75	67	75	75
Springbank flush	46	54	61	58
<i>Schoenus</i> field	55	60	61	65
<i>Homalothecium</i> fen	75	75	75	36
2006	11 June	3 July	24 July	3 August
Tufa spring (north traps)	75	75	75	75
Tufa spring (untrapped tufa)	75	75	75	75
Springbank flush	64	75	60	49
<i>Schoenus</i> field	75	75	25	49
<i>Homalothecium</i> fen	75	54	0	0
Entrance flush	50	75	64	61
Springbank wood	75	n.d.	75	n.d.
Pollardstown ponds	75	n.d.	75	n.d.



PLATE 1. The Tufa Spring at Pollardstown Fen, facing south (from a 1989 photograph).
Photograph: Jervis Good.



PLATE 2. Emergence trap on *Palustriella*-covered tufa deposit. Photograph: Jervis Good.

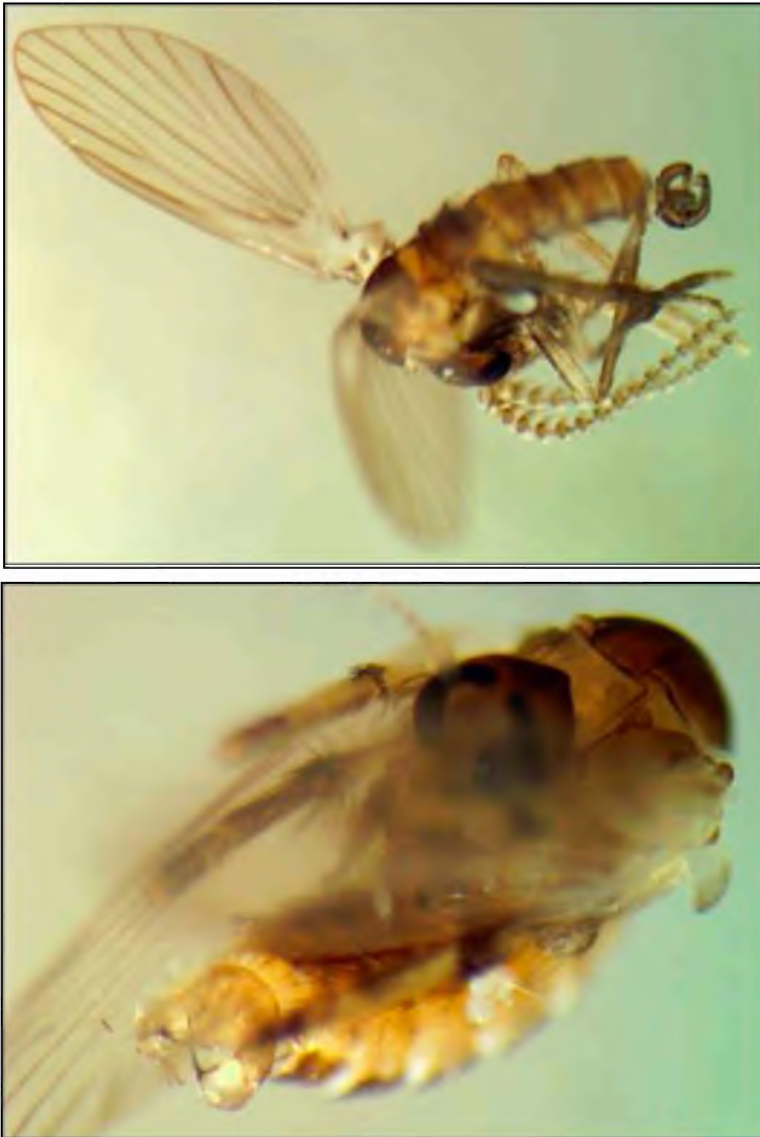


PLATE 3. Above: *Paramormia (Phyllotelmatoscopus) decipiens* ♂. Below: *Pericoma calcilega* ♂. Both as seen in emergence trap samples. Photographs: Jervis Good.



4A.



4B.



4C.

PLATE 4. Moss-expressed water level categories: 0 - no water visible (4A); 1- water visible but not covering all inter-digit webbing (4B); 2 - covering all inter-digit webbing but not covering fingers (not shown); 3 - covering fingers (4C). Photographs: Jervis Good.

NEW DISTRIBUTIONAL DATA ON THE CADDISFLIES (TRICHOPTERA) OF IRELAND

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Abstract

Recently discovered data on the caddisflies (Trichoptera) of Ireland are reported. New monad and hectad records are included. New county records are noted.

Key words: Trichoptera, caddisflies, Ireland, new records, distribution.

Introduction

Since O'Connor and O'Connor, (2020), the most recent summaries of the distributions of the Irish caddisflies (Trichoptera) are to be found in O'Connor (2020a, 2021). The latter work also contains updated information on flight-periods and county distributions. Subsequently, O'Connor and Feeley (2021) and Nolan (2021) have provided additional data. The present paper increases this body of information and contains new monad (1km²) and hectad (10km²) records. New county records are reported. For completeness, new county records from Nolan and O'Connor (2020), O'Connor (2020b), Nolan (2021) and O'Connor and Feeley (2021), are noted if not already cited in O'Connor and O'Connor (2020). Four figure (1km²) Irish grid references are given for each record. The more important discoveries are shown (Figs 1-30).

Unless otherwise stated, specimens were identified by the senior author using Malicky (2004), Barnard and Ross (2012) and Salokannel and Mattila (2018). Voucher material of the rarer species has been retained in the O'Connor collection.

Addendum 5

Addendum 5 to the dataset "Caddisflies (Trichoptera) of Ireland", was uploaded by the National Biodiversity Data Centre on the 19 November 2020 <<https://maps.biodiversityireland.ie/Dataset/250>> (O'Connor, 2020a). There are presently 17219 records for 156 species from 656 sites.

Addendum 6

The records in this paper, O'Connor and Feeley (2021) and Nolan (2021) will be sent to the National Biodiversity Data Centre in Addendum 6 for incorporation into the above dataset.

The records

RHYACOPHILIDAE

Rhyacophila dorsalis (Curtis, 1834)

ANTRIM: Greenmount Campus near Six Mile Water and Lough Neagh (J1584), 1♂1♀ 11 May 2016, light-trap, R. Monteith.

DUBLIN: River Dodder, Firhouse Road, Knocklyon (O1127), 1♂ 18 June 2020, Knocklyon (O1128), 1♂ 18 June 2020, both collected & determined J. T. Brophy.

MONAGHAN: Mountain Water, Derrykinnigh Beg (H6243), 1♀ 7 October 2020. River Finn, Edenaforan (H5428), 1♂ 8 October 2020. Both collected & determined J. T. Brophy.

TIPPERARY: Ballywilliam, Ballyporeen, Cahir (R9009), 1♂ 7 August 2021, on a window, S. Voss.

GLOSSOSOMATIDAE

Agapetus fuscipes Curtis, 1834

OFFALY: Raheenduff (N4019), 1♀ 15 July 2020, collected & determined J. T. Brophy.

Agapetus ochripes Curtis, 1834

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 5 September 2021, light-trap, C. McNaughton.

Glossosoma conformis Neboiss, 1963 (Fig. 1)

Recorded as new to County Galway from the Clare (Galway) River (M4049) by O'Connor and Feeley (2021).

ANTRIM: Greenmount Campus near Six Mile Water and Lough Neagh (J1584), 1♀ 30 July 2015 & 1♀ 29 June 2019, light-trap, R. Monteith.

OFFALY: Rathgibbon (N1407), 1♀ 15 August 2021, light-trap, R. Mc Kenna.

HYDROPTILIDAE

Agraylea multipunctata Curtis, 1834

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 27 July 2020, C. McNaughton.

DUBLIN: Grand Canal Dock (O1734), 2♂♂1♀ 28 July 2020, collected & determined J. T. Brophy.

GALWAY: Lough Derg, Portumna Forest Park (M8503), 1♂ 1 August 2020, collected & determined J. T. Brophy.

Agraylea sexmaculata Curtis, 1834 New to County Cavan (Fig. 2)

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, adult 5 June 2020, light-trap, R. Monteith (NBN, 2021).

This was the first record for County Antrim (O'Connor, 2021).

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♂ 10 September 2021, light-trap, C. McNaughton. Lough Sheelin, Chambers Bay (N4285), 1♂ 7 September 2021, C. McNaughton.
***Allotrichia pallicornis* (Eaton, 1873) (Fig. 3)**

Recorded as new to County Mayo from Lough Cullin (G2301) by O'Connor and Feeley (2021).

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂ 29 June 2019 & 2♂♂ 17 August 2020, light-trap, R. Monteith.

KILDARE: River Liffey, Castletown Estate, Celbridge (N9733), 10♂♂2♀♀ 10 June 2021, stream flowing into the River Liffey, Castletown Estate, Celbridge (N9833), 1♂ 10 June 2021, both J. P. O'Connor & M. A. O'Connor.

WATERFORD: Tramore (S5701), 1♂ 30 May 2020, light-trap, T. Bryant.

***Hydroptila angulata* Mosely, 1922 New to Counties Cavan and Clare (Fig. 4)**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 3♀♀ 5 September 2021, light-trap, Mullaghboy (N4285), 1♀ 23 August 2021, light-trap, both C. McNaughton.

CLARE: Lough Derg, Williamstown Harbour (R7787), 2♂♂ 2 August 2020, collected & determined J. T. Brophy.

***Hydroptila cornuta* Mosley, 1922**

Recorded as new to County Meath from the River Boyne (N8056) by O'Connor (2020b).

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♂ 24 August 2021 & 5♀♀ 5 September 2021, light-trap, C. McNaughton.

***Hydroptila forcipata* (Eaton, 1873) New to County Antrim (Fig. 5)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♀ 29 June 2019 & 1♀ 17 August 2020, light-trap, R. Monteith.

***Hydroptila pulchricornis* Pictet, 1834**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 29 June 2020, light-trap, C. McNaughton.

***Hydroptila simulans* Mosely, 1920**

DUBLIN: Castleknock (O0837), 1♂ 25 August 2021, on the outside of lighted window, suburban house, J. P. O'Connor.

***Hydroptila sparsa* Curtis, 1834 New to County Antrim (Fig. 6)**

The species was taken in 1994 at Rosroe (Barnanora) (L7541) by M. C. D. Speight (O'Connor and O'Connor, 2020) and this was the first record for County Galway.

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♀ 29 June 2019 & 1♀ 17 August 2020, light-trap, R. Monteith.

DUBLIN: Royal Canal, Castleknock (O0938), 1♂ 8 August 2021, M. A. O'Connor.

KILDARE: stream flowing into the River Liffey, Castletown Estate, Celbridge (N9833), 1♂1♀ 10 June 2021, J. P. O'Connor & M. A. O'Connor.

***Hydroptila tineoides* Dalman, 1819 (Fig. 7)**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 27 July 2020 & 8♀♀ 5 September 2021, light-trap, Crover (N4786), 2♀♀ 8 September 2021, light-trap, C. McNaughton.

GALWAY: Lough Derg, Portumna Forest Park (M8202), 1♀ 1 August 2020, collected & determined J. T. Brophy.

WATERFORD: Tramore (S5701), 1♀ 3 June 2020, light-trap, T. Bryant.

This was the first record for County Waterford (O'Connor, 2021).

***Ithytrichia lamellaris* Eaton, 1873**

WICKLOW: Clara Vale near the Avonmore River (T1892), 1♀ 24 June 2020, light-trap, C. Osthoff, determined K. G. M. Bond.

***Orthotrichia angustella* (McLachlan, 1865) (Fig. 8)**

Recorded as new to County Galway from the Screeb River (L9740) by O'Connor and Feeley (2021).

WATERFORD: Ballyscanlan Lake (S5402), 1♂ 19 May 2020, light-trap, T. Bryant.

***Orthotrichia costalis* (Curtis, 1834)**

WATERFORD: Belle Lake, pump house (S6605), 1♂ 14 October 2020, light-trap, A. Walshe. Tramore (S5701), 1♀ 28 July 2020, light-trap, T. Bryant.

The previous known Irish flight period was June-July.

***Oxyethira flavicornis* (Pictet, 1834)**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 12 September 2021, light-trap, C. McNaughton. Corglass, Lough, Kilnaleck (N4292), 3♀♀ 9 September 2021, light-trap, C. McNaughton. Lough Sheelin, Crover (N4786), 7♀♀ 8 September 2021, light-trap, Chambers Bay (N4285), 1♀ 5 September 2021, light-trap, both C. McNaughton.

***Oxyethira frici* Klapálek, 1891 New to County Cork (Fig. 9)**

CORK: Glengarriff Wood (V9175), 2♀♀ 10 August 2020, G. O'Donnell, determined K. G. M. Bond.

PHILOPOTAMIDAE

***Philopotamus montanus* (Donovan, 1813)**

Recorded as new to County Offaly from the Silver River (N2407) by Nolan and O'Connor (2020).

ANTRIM: Dungonnell Dam near Cargan (D1917), 1♀ 24 April 2021, C. McNaughton.

DUBLIN: Glencullen River, Boranaraltry Bridge (O1620), 1♂ 25 April 2021, collected & determined H. B. Feeley. Owendoher River, Cruagh (O1322), 1♂1♀ 19 July 2020, Cruagh Road Bridge (O1322), 1♂1♀ 25 April 2021, both collected & determined H. B. Feeley.

***Wormaldia mediana* McLachlan, 1878 (Fig. 10)**

MEATH: River Boyne, Navan (N8868), 1♀ 26 June 2020, collected & determined J. T. Brophy.

This was the first record for County Meath (O'Connor, 2021).

***Wormaldia occipitalis* (Pictet, 1834)**

DUBLIN: Glencullen River, Enniskerry (O2217), 1♂2♀♀ 20 June 2020, collected J. T. Brophy, determined J. T. Brophy & J. P. O'Connor.

GALWAY: Knockaunranny Stream, bridge upstream of Ross Lake (M1935), 1♂ 11 August 2021, H. B. Feeley.

ECNOMIDAE

***Ecnomus tenellus* (Rambur, 1842)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♀ 5 May 2016, light-trap, R. Monteith.

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♂ 16 July 2020, light-trap, C. McNaughton.

POLYCENTROPOPIDAE

***Holocentropus dubius* (Rambur, 1842) (Fig. 11)**

Recorded as new to County Sligo from Lough Arrow (G7808) by O'Connor and Feeley (2021).

***Holocentropus picicornis* (Stephens, 1836)**

WATERFORD: Ballyscanlan Lake (S5402), 1♀ 27 May 2020, light-trap, T. Bryant. Great Newtown Head (X5698), 1♂ 14 August 2020, light-trap, T. Bryant.

***Neureclipsis bimaculata* (Linnaeus, 1758)**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 5 September 2021, light-trap, C. McNaughton.

LEITRIM: River Shannon, Jamestown (M9797), 7♂♂ 2 August 2021, M. A. O'Connor.

***Plectrocnemia conspersa* (Curtis, 1834)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂ 15 September 2019, light-trap, R. Monteith.

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 10 September 2021 & 1♀ 12 September 2021, light-trap, C. McNaughton.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1♂ 16 September 2020, light-trap, C. McNaughton.

***Plectrocnemia geniculata* McLachlan, 1871**

CORK: Fota Wildlife Park (W7871), 1♀ 12-18 October 2020 & 1♀ 21-29 June 2021, Rothamsted Insect Survey light-trap, per A. Riley.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1♀ 17 September 2020, light-trap, C. McNaughton.

***Polycentropus flavomaculatus* (Pictet, 1834)**

ANTRIM: Greenmount Campus near Six Mile Water and Lough Neagh (J1584), 1♂ 30 July 2015, 1♂ 5 August 2015, 1♂1♀ 3 August 2017 & 1♀ 17 August 2020, light-trap, R. Monteith.

CORK: Fota Wildlife Park (W7871), 1♀ 5-11 July 2021, Rothamsted Insect Survey light-trap, per A. Riley.

GALWAY: Lough Derg, Portumna Forest Park (M8503), 1♂ 1 August 2020, collected & determined J. T. Brophy.

LEITRIM: River Shannon, Jamestown (M9797), 1♂ 2 August 2021, M. A. O'Connor.

MEATH: woods at the south-east corner of Lough Sheelin (N4582), 2♀♀ 25 August 2021, light-trap, C. McNaughton.

PSYCHOMYIIDAE

***Lype phaeopa* (Stephens, 1836)**

WESTMEATH: Lough Sheelin, Goreport (N4381), 1♂ 23 August 2021, C. McNaughton.

***Lype reducta* (Hagen, 1868)**

Recorded as new to County Waterford from Belle Lake (S6605) by O'Connor (2020b).

***Psychomyia pusilla* (Pictet, 1834)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂ 30 July 2015, 2♀♀ 3 August 2017, 66♂♂8♀♀ 29 June 2019 & 1♀ 2 June 2020, light-trap, R. Monteith.

***Tinodes maclachlani* Kimmins, 1966 New to County Derry (Fig. 12)**

DERRY: White Rocks, small stream (C8840), 1♀ 27 June 2021, C. McConaghy, determined P. Langton.

DUBLIN: River Dodder, Firhouse Road, Knocklyon (O1127), 1♂ 18 June 2020, on weir structure, collected & determined J. T. Brophy.

***Tinodes maculicornis* (Pictet, 1834)**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 29 June 2020, 1♀ 16 July 2020 & 2♂♂1♀ 7 September 2021, light-trap, C. McNaughton.

CLARE: Lough Derg, Williamstown Harbour (R7787), 1♀ 2 August 2020, collected & determined J. T. Brophy.

GALWAY: Lough Derg, Portumna Forest Park (M8202), 1♂ 1 August 2020, collected & determined J. T. Brophy.

WESTMEATH: Lough Sheelin, Goreport (N4381), 1♂ 23 August 2021, C. McNaughton.
***Tinodes unicolor* (Pictet, 1834)**

DUBLIN: tufa spring above the Bohernabreena Reservoir (O0922), 1♂ 24 June 2020, collected & determined J. T. Brophy.

***Tinodes waeneri* (Linnaeus, 1758)**

ANTRIM: Lough Fea near Cookstown (H7587), 1♂ 8 August 2019, R. Monteith.

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 10 September 2021, light-trap, C. McNaughton. Corglass Lough, Kilnaleck (N4292), 1♀ 9 September 2021, light-trap, C. McNaughton.

DUBLIN: Phoenix Park, (O1334), adult 19 May 2020, J. O'Neill. River Dodder, Dartry (O1629), 1♀ 16 June 2020, Firhouse Road, Knocklyon, (O1127), 1♂ 18 June 2020, both collected & determined J. T. Brophy. Santry Stream, Santry (O1640), 1♂ 23 June 2020, collected & determined J. T. Brophy.

GALWAY: Lough Derg, Portumna Forest Park (M8202), 1♂ 1 August 2020, collected & determined J. T. Brophy.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1♀ 17 September 2020, light-trap, C. McNaughton.

HYDROPSYCHIDAE

***Cheumatopsyche lepida* (Pictet, 1834)**

MEATH: River Boyne, Navan (N8868), 1♂2♀♀ 26 June 2020, collected & determined J. T. Brophy.

***Hydropsyche instabilis* (Curtis, 1834) New to County Meath (Fig. 13)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 2♀♀ 10 May 2020 & 1♀ 17 August 2020, light-trap, R. Monteith.

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 6 September 2020, light-trap, C. McNaughton.

MEATH: Ardsallagh (N8963), 1♀ 22 May 2021, on car windscreen, D. A. Murray.

Although the River Boyne was only 250m from the parked car, the specimen probably came from one of the nearby streams flowing into the river.

WATERFORD: Great Newtown Head, Tramore (X5698), 1♀ 10 August 2020 & 1♀ 14 August 2020, light-trap, T. Bryant.

***Hydropsyche pellucidula* (Curtis, 1834)**

CAVAN: bog near Finnea beside the River Inny (N4082), 1♀ 10 September 2021, light-trap, C. McNaughton.

***Hydropsyche siltalai* Döhler, 1963**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♀ 29 June 2019, 1♀ 10 May 2020 & 1♀ 2 June 2020, light-trap, R. Monteith.

CAVAN: Corglass Lough, Kilnaleck (N4292), 1♀ 9 September 2021, light-trap, C. McNaughton.

CORK: Dromdeer East near Doneraile (R6306), 1♀ 1 August 2020, light-trap, K. G. M. Bond.

KILDARE: stream flowing into the River Liffey, Castletown Estate, Celbridge (N9833), 1♂ 10 June 2021, J. P. O'Connor & M. A. O'Connor.

OFFALY: Killaun Bog (N1005), 1♀ 24 August 2021, light-trap, R. Mc Kenna.

PHRYGANEIDAE

***Agrypnia obsoleta* (Hagen, 1864)**

CAVAN: Lough Sheelin, Mullaghboy (N4285), 2♂♂ 23 August 2021, light-trap, C. McNaughton.

***Agrypnia varia* (Fabricius, 1793) New to County Meath (Fig. 14)**

MEATH: woods at the south-east corner of Lough Sheelin (N4582), 1♀ 25 August 2021, light-trap, C. McNaughton.

WESTMEATH: Lough Sheelin, Goreport (N4381), 1♀ 23 August 2021, C. McNaughton.

***Hagenella clathrata* (Kolenati, 1848) (Fig. 15)**

Recorded as new to County Offaly from Killaun Bog (N1005) by Nolan (2021).

***Phryganea bipunctata* Retzius, 1783**

ANTRIM: Lough Fea near Cookstown (H7587), 1♂ 8 August 2019, R. Monteith.

***Phryganea grandis* Linnaeus, 1758**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♀ 29 June 2019, light-trap, R. Monteith.

GOERIDAE

***Goera pilosa* (Fabricius, 1775) (Fig. 16)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂ 17 August 2020, light-trap, R. Monteith.

Previously recorded from County Antrim from Kilgad (Riversdale) Lake (J1798), Kells, by O'Connor and McNaughton (2019). This was omitted from the county list in O'Connor (2021).

DUBLIN: River Dodder, Dartry (O1529), 1♂ 16 June 2020, collected & determined J. T. Brophy.

***Silo nigricornis* (Pictet, 1834)**

Recorded as new to County Roscommon from the Cloonfad River (M4971) by O'Connor and Feeley (2021).

LEPIDOSTOMATIDAE

***Crunoecia irrorata* (Curtis, 1834)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂ 30 July 2015, light-trap, R. Monteith.

***Lepidostoma basale* (Kolenati, 1848)**

Recorded as new to County Roscommon from the Cloonfad River (M4971) by O'Connor and Feeley (2021).

***Lepidostoma hirtum* (Fabricius, 1775)**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 2♀♀ 12 September 2021, light-trap, C. McNaughton.

LEITRIM: River Shannon, Jamestown (M9797), 1♂ 2 August 2021, M. A. O'Connor.

APATANIDAE

***Apatania muliebris* McLachlan, 1866**

ANTRIM: Garron spring (D2619), 1♀ 23 April 2020, C. McNaughton. Lough na Bric (D2519), 6♀♀ 23 April 2020, collected from the edge of the lake, C. McNaughton.

LIMNEPHILIDAE

***Drusus annulatus* (Stephens, 1837)**

ANTRIM: Waterloo Gardens, Belfast (J3378), 2♂♂ 18 September 2021, P. Thomlinson.

DERRY: White Rocks, small stream (C8840), 1♂ 27 June 2021, C. McConaghy.

TIPPERARY: Ballywilliam, Ballyporeen, Cahir (R9009), 1♀ 17 September 2020, S. Voss.

***Chaetopteryx villosa* (Fabricius, 1798) New to County Monaghan (Fig. 17)**

MONAGHAN: River Finn, Edenaforan (H5428), 1♂ 8 October 2020, collected & determined J. T. Brophy.

TIPPERARY: Ballywilliam, Ballyporeen, Cahir (R9009), 1♀ 21 October 2020, S. Voss.

***Anobolia brevipennis* (Curtis, 1834)**

CAVAN: Lough Sheelin, Mullaghboy (N4285), 1♂ 19 August 2021, light-trap in woods, C. McNaughton.

This is the second record for County Cavan and the first Irish record from August.

***Glyphotaelius pellucidus* (Retzius, 1783) New to County Offaly (Fig. 18)**

LAOIS: Deerpark near Ballyfin (N3803), adult 25 May 2020, on window ledge, R. Duff, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre). Shanahoe (S3985), adult 3 June 2020, C. Uys, determined C. McNaughton, from photograph (National Biodiversity Data Centre).

MEATH: woods at the south-east corner of Lough Sheelin (N4582), 1♂1♀ 25 August 2021, light-trap, C. McNaughton.

OFFALY: Killaun Bog (N1005), 1♂ 19 July 2021, light-trap, R. Mc Kenna. Rathgibbon, South, Killyon (N1306), 1♀ 28 May 2021 & 1♂ 26 June 2021, light-trap, R. Mc Kenna.

***Grammotaulius nigropunctatus* (Retzius, 1783) New to Counties Laois and Limerick (Fig. 19) (Plate 1)**

LAOIS: Shanahoe (S3985), 2 adults 30 May 2020, C. Uys, confirmed J. P. O'Connor from photographs (National Biodiversity Data Centre).

LIMERICK: Drumlohan, Kilcornan (R4052), adult 24 May 2021, L. Nolan, determined C. McNaughton from photograph, confirmed J. P. O'Connor.

***Limnephilus affinis* Curtis, 1834**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 2♀♀ 5 September 2021, light-trap, C. McNaughton. Corglass Lough, Kilnaleck (N4292), 2♂♂ 9 September 2021, light-trap, C. McNaughton.

WATERFORD: Great Newtown Head, Tramore (X5698), 1♀ 10 August 2020, light-trap, T. Bryant.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1♀ 16 September 2020, light-trap, C. McNaughton.

***Limnephilus auricula* Curtis, 1834**

ANTRIM: Springfarm (J1588), 1♂ 29 April 2015, light-trap, R. Monteith.

LAOIS: Shanahoe (S3985), adult 10 June 2020, C. Uys, determined J. P. O'Connor from photograph (National Biodiversity Data Centre).

OFFALY: Killaun Bog (N1005), 1♂1♀ 24 August 2021, light-trap, R. Mc Kenna. Rathgibbon (N1407), 1♀ 15 August 2021, light-trap, R. Mc Kenna.

TIPPERARY: Ballywilliam, Ballyporeen, Cahir (R9009), shed-wall, 1♂ 7 August 2021, S. Voss.

***Limnephilus binotatus* Curtis, 1834 New to County Kildare (Fig. 20)**

Recorded as new to County Waterford from Belle Lake (S6605) by O'Connor (2020b).

KILDARE: Ballyvoneen (N8040), adult 2 April 2020, light-trap, P. Sheridan, determined C. McNaughton from photograph, confirmed J. P. O'Connor.

This is the earliest known Irish adult.

***Limnephilus decipiens* (Kolenati, 1848)**

CAVAN: Lough Sheelin, Crover (N4786), 1 ♀ 8 September 2021, light-trap, C. McNaughton.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1 ♀ 17 September 2020, light-trap, C. McNaughton.

***Limnephilus elegans* Curtis, 1834 New to County Armagh (Fig. 21)**

ARMAGH: Peatlands Park (H9061), adult 1 July 2021, A. Boyle, determined C. McNaughton from photograph.

***Limnephilus flavicornis* (Fabricius, 1787)**

CAVAN: Corglass Lough, Kilnaleck (N4292), 1 ♂ 5 ♀♀ 9 September 2021, light-trap, C. McNaughton. Lough Sheelin, Crover (N4786), 1 ♀ 8 September 2021, light-trap, C. McNaughton.

DUBLIN: Áras an Uachtaráin, Phoenix Park (O1235), adult 25 May 2020, in ditch, J. O'Neill, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

The species is already known from the adjoining Dublin Zoo (O1235).

MEATH: woods at the south-east corner of Lough Sheelin (N4582), 5 ♀♀ 25 August 2021, light-trap, C. McNaughton.

OFFALY: Rathgibbon South, Killyon (N1306), adult 2 July 2021, light-trap, R. Mc Kenna, determined C. McNaughton from photograph.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 2 ♀♀ 16 September 2020, light-trap, C. McNaughton.

***Limnephilus hirsutus* (Pictet, 1834) (Fig. 22)**

ANTRIM: Greenmount Campus (J1584), 1 ♀ 23 September 2019, light-trap, R. Monteith.

WATERFORD: Great Newtown Head, Tramore (X5698), 1 ♂ 2 ♀♀ 10 August 2020, light-trap, T. Bryant.

***Limnephilus incisus* Curtis, 1834**

Recorded as new to County Tipperary from Ballywilliam (R9009) by O'Connor (2020b).

***Limnephilus lunatus* Curtis, 1834**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1 ♂ 2 ♀♀ 10 September 2021, light-trap, C. McNaughton. Dunaweel (H2607), adult 21 November 2020, several lakes nearby, H. Bothwell, determined J. P. O'Connor from photograph (National Biodiversity Data Centre).

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 3 ♀♀ 17 September 2020, light-trap, C. McNaughton.

***Limnephilus luridus* Curtis, 1834**

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1 ♂ 16 September 2020, light-trap, C. McNaughton.

***Limnephilus marmoratus* Curtis, 1834**

ANTRIM: Waterloo Gardens, Belfast (J3378), 1♀ 4 September 2021, light-trap, P. Thomlinson.

CAVAN: bog near Finnea, Lough Sheelin (N4082), 2♀♀ 10 September 2021, light-trap, C. McNaughton. Corglass Lough, Kilnaleck (N4292), 2♀♀ 9 September 2021, light-trap, C. McNaughton. Lough Sheelin, Crover (N4786), 1♀ 8 September 2021, light-trap, C. McNaughton.

KERRY: Tullamore, Listowel (R0040), adult 16 August 2020, feeding on umbellifers, P. Halpin, determined J. P. O'Connor from photograph (National Biodiversity Data Centre).

LAOIS: Shanahoe (S3985), adult 3 June 2020, C. Uys, determined J. P. O'Connor from photograph (National Biodiversity Data Centre).

LEITRIM: River Shannon, Jamestown (M9797), 1♀ 2 August 2021, M. A. O'Connor.

OFFALY: Killaun Bog (N1005), 1♀ 24 August 2021, light-trap, R. Mc Kenna. Rathgibbon (N1407), 1♂ 15 August 2021, light-trap, R. Mc Kenna.

WATERFORD: Ballyscanlan Lake (S5402), 1♀ 9 November 2020, light-trap, T. Bryant. Great Newtown Head, Tramore (X5698), 1♀ 14 August 2020 & 1♂ 16 September 2020, light-trap, T. Bryant.

The Ballyscanlan Lake date of 9 November is the latest known one for an adult of *Limnephilus marmoratus* in Ireland.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1♂3♀♀ 17 September 2020, light-trap, C. McNaughton.

***Limnephilus rhombicus* (Linnaeus, 1758) New to County Laois (Fig. 23) (Plate 2)**

LAOIS: Shanahoe (S3985), adult 18 June 2020, C. Uys, determined C. McNaughton, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

***Limnephilus sparsus* Curtis, 1834 New to County Laois (Fig. 24)**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 11 September 2021, light-trap, C. McNaughton.

LAOIS: Deerpark near Ballyfin (N3803), adult 17 May 2020, R. Duff, determined C. McNaughton and confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

OFFALY: Killaun Bog (N1005), 1♂1♀ 24 August 2021, light-trap, R. Mc Kenna. Rathgibbon, South, Killyon (N1306), adult 2 July 2021, light-trap, R. Mc Kenna.

WATERFORD: Ballyscanlan Lake (S5402), 1♂ 22 April 2020 & 1♂ 16 May 2020, light-trap, T. Bryant.

***Limnephilus vittatus* (Fabricius, 1798) New to County Laois (Fig. 25)**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 11 September 2021, light-trap, C. McNaughton. Lough Sheelin, Chambers Bay (N4285), 1♂ 6 September 2020, light-trap, C. McNaughton. Corglass Lough, Kilnaleck (N4292), 1♀ 9 September 2021, light-trap, C. McNaughton.

CLARE: Bell Harbour (M2808), adult 23 July 2021, light-trap, R. Mc Kenna, determined C. McNaughton from photograph.

LAOIS: Shanahoe (S3985), adults 14, 16 & 27 May 2020, 19 June 2020, C. Uys, determined J. P. O'Connor from photographs (National Biodiversity Data Centre).

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1♀ 16 September 2020, light-trap, C. McNaughton.

***Halesus digitatus* (Schrank, 1781)**

CAVAN: Dunaweel (H2607), adult 21 November 2020, light-trap, H. Bothwell, determined C. McNaughton from photograph (National Biodiversity Data Centre).

***Halesus radiatus* (Curtis, 1834)**

ANTRIM: Waterloo Gardens, Belfast (J3378), 1♂ 26 September 2021, light-trap, P. Thomlinson.

LAOIS: Ballyboodin, near Rivers Goul and Erkina (S3677), 5 adults 3 October 2020, UV lamp, M. Brennan, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre). Shanahoe (S3985), adult, October 2019, C. Uys, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

The species was previously recorded from square S3677 when M. Kelly-Quinn reported 20 larvae from the River Goul (O'Connor and O'Connor, 2019) but the county was given by her as Kilkenny instead of Laois.

TIPPERARY: Ballywilliam, Ballyporeen, Cahir (R9009), 1♀ 9 September 2020, 1♀ 7 September 2021 & 1♂ 8 September 2021, S. Voss.

These adults confirm the identification of two larvae collected on 14 May 2020.

WATERFORD: bog at Finea, Lough Sheelin (N4181), 1♂ 16 September 2020, light-trap, C. McNaughton.

WEXFORD: Rathnure (S9137), adult 17 October 2020, C. Moriarty, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

***Micropterna lateralis* (Stephens, 1837)**

Recorded as new to County Tipperary from Ballywilliam (R9009) by O'Connor (2020b).

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 14 September 2020, light-trap, C. McNaughton.

WATERFORD: Ballyscanlan Lake (S540), 1♂ 19 May 2020, light-trap, T. Bryant.

***Micropterna sequax* McLachlan, 1875**

Recorded as new to County Tipperary from Ballywilliam (R9009) by O'Connor (2020b).

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♂ 6 September 2020, light-trap, C. McNaughton.

WATERFORD: Great Newtown Head, Tramore (X5698), 1♂ 10 August 2020, light-trap, T. Bryant.

***Potamophylax cingulatus* (Stephens, 1837)**

WATERFORD: Great Newtown Head, Tramore (X5698), 1♀ 14 August 2020, light-trap, T. Bryant. Tramore (S5701), 1♀ 5 September 2020, light-trap, T. Bryant.

***Potamophylax latipennis* (Curtis, 1834)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂ 23 September 2019, light-trap, R. Monteith.

DERRY: White Rocks, small stream (C8840), 1♂ 25 July 2021, C. McConaghy, determined P. Langton.

TIPPERARY: Ballywilliam, Ballyporeen, Cahir (R9009), 1♀ 26 August 2021, on a window, S. Voss.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 1♂ 16 September 2020, light-trap, C. McNaughton.

***Stenophylax permistus* McLachlan, 1895 New to County Kilkenny (Fig. 26)**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♂ 12 September 2021, light-trap, C. McNaughton.

KILKENNY: Ballinaboley, Kilmacow (S5320), ♂ 24 March 2020, A. Allen, determined J. T. Brophy.

WATERFORD: Tramore (S5701), 2♂♂ 13 March 2020, light-trap, T. Bryant.

The 13 March is the earliest adult date for the species in Ireland.

SERICOSTOMATIDAE

***Sericostoma personatum* (Spence, 1826)**

Recorded as new to County Offaly from Knockbarron Wood (N1706) by Nolan and O'Connor (2020).

CORK: Cork City (W6471), 1♂ 9 July 2020, S. Waheed.

DUBLIN: Owendoher River, Cruagh (O1322), 1♂ 19 July 2020. River Dodder, Dartry (O1629), 1♀ 7 June 2020. All collected & determined J. T. Brophy.

WICKLOW: Greystones (O2813), adult 11 June 2020, C. Mc Kenna, determined J. P. O'Connor from photograph (National Biodiversity Data Centre).

BERAEIDAE

***Beraea maurus* (Curtis, 1834) New to County Westmeath (Fig. 27)**

The species was taken in 1994 at Rosroe (Barnna-nOra) (L7541) by M. C. D. Speight (O'Connor and O'Connor, 2020) and this was the first record for County Galway.

WESTMEATH: Goreport, Lough Sheelin (N4381), 1♀ 16 July 2021, C. McNaughton.

***Beraea pullata* (Curtis, 1834)**

KILDARE: stream flowing into the River Liffey, Castletown Estate, Celbridge (N9833), 1♂1♀ 10 June 2021, J. P. O'Connor & M. A. O'Connor.

ODONTOCERIDAE

***Odontocerum albicorne* (Scopoli, 1763)**

CORK: Mullihassig Wood near Coachford (W4275), adult 12 July 2021, M. O'Sullivan, determined C. McNaughton from photograph.

MOLANNIDAE

***Molanna albicans* (Zetterstedt, 1840) New to County Clare (Fig. 28)**

CLARE: Lough Derg, Williamstown Harbour (R7787), 1♀ 2 August 2020, collected & determined J. T. Brophy.

LEPTOCERIDAE

***Adicella reducta* (McLachlan, 1865)**

CORK: Mullihassig Wood near Coachford (W4275), adult 12 July 2021, M. O'Sullivan, determined C. McNaughton from photograph.

***Athripsodes albifrons* (Linnaeus, 1758)**

CORK: River Lee, Cork City (W6471), 2♂♂ 5 July 2020, collected & determined J. T. Brophy.

LAOIS: Ballyboodin near Rivers Goul and Erkina (S3677), adult 6 August 2020, M. Brennan, determined by S. Stone from photographs (National Biodiversity Data Centre).

OFFALY: Killaun Bog (N1005), adult 19 July 2021, light-trap, R. Mc Kenna, determined C. McNaughton from photograph.

TIPPERARY: Ballybeg, near the River Suir (S1417), adult 20 August 2020, L. Garcia, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

***Athripsodes aterrimus* (Stephens, 1836)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂ 29 June 2019 & 1♂ 17 August 2020, light-trap, R. Monteith.

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 10 September 2021, light-trap, C. McNaughton.

DUBLIN: Áras an Uachtaráin, Phoenix Park (O1235), 1♀ 28 May 2020, in vegetation beside small pond, S. Hodge. Castleknock (O0837), 1♀ 3 August 2021, dead in a spider's web, suburban house, J. P. O'Connor.

WATERFORD: Great Newtown Head (X5698), 1♀ 10 August 2020, light-trap, T. Bryant. Tramore (S5701), 1♀ 27 July 2020, light-trap, T. Bryant.

WESTMEATH: Lough Sheelin, Goreport shore (N4381), 3♀♀ 1 July 2020 & 5♀♀ 23 August 2021, C. McNaughton.

***Athripsodes cinereus* (Curtis, 1834)**

CORK: River Lee, Cork City (W6471), 3♂♂3♀♀ 5 July 2020, collected & determined J. T. Brophy.

GALWAY: Lough Derg, Portumna Forest Park (M8202), 1♂ 1 August 2020, collected & determined J. T. Brophy.

KILDARE: Royal Canal, Leixlip (O0037), adult 12 July 2020, on canal-side vegetation, C. Lee, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

***Ceraclea albimacula* (Rambur, 1842)**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 3♂♂1♀ 10 September 2021, light-trap, C. McNaughton.

***Ceraclea dissimilis* (Stephens, 1836) New to County Waterford (Fig. 29)**

Recorded as new to County Meath from the River Boyne (N8056) by O'Connor (2020b).

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♀ 29 June 2019, light-trap, R. Monteith.

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 10 September 2021, light-trap, C. McNaughton.

WATERFORD: Belle Lake, pump house (S6605), 1♀ 14 October 2020, light-trap, A. Walshe.

***Ceraclea fulva* (Rambur, 1842)**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 14 September 2020, light-trap, C. McNaughton.

WESTMEATH: bog at Finea, Lough Sheelin (N4181), 2♀♀ 16 September 2020 & 1♂ 17 September 2020, light-trap, C. McNaughton.

***Ceraclea senilis* (Burmeister, 1839)**

CAVAN: Lough Sheelin, Mullaghboy (N4285), 1♂ 20 August 2021, light-trap, C. McNaughton.

DUBLIN: Grand Canal Dock (O1734), 1♂ pupa 28 July 2020, grab sampler, collected & determined J. T. Brophy.

***Leptocerus tineiformis* Curtis, 1834 New to County Cavan (Fig. 30)**

CAVAN: Lough Sheelin, Mullaghboy (N4285), 1♀ 17-18 July 2021, light-trap, C. McNaughton.

GALWAY: Lough Derg, Portumna Forest Park (M8503), 1♂1♀ 1 August 2020, collected & determined J. T. Brophy.

This was the first record for County Galway (O'Connor, 2021).

WATERFORD: Ballyscanlan Lake (S5402), 1♀ 24 June 2020 & 1♀ 30 July 2020, light-trap, T. Bryant.

***Mystacides azurea* (Linnaeus, 1761)**

CAVAN: Lough Sheelin, Chambers Bay (N4285), 1♀ 5 September 2021, light-trap, C. McNaughton.

DUBLIN: Rathfarnham (O1327), adult 2-3 June 2020, light-trap, Á. O'Connor, determined J. T. Brophy from photograph. River Dodder, Dartry (O1629), 3♂♂ 7 June 2020, Firhouse Road, Knocklyon (O1127), 1♀ 18 June 2020, Milltown (O1629), 2♂♂ 7 June & 1♂ 16 June 2020, all collected & determined J. T. Brophy.

KERRY: Killarney (V9588), adult 3 June 2020, U. Harris, determined J. P. O'Connor from photograph (National Biodiversity Data Centre).

LEITRIM: River Shannon, Jamestown (M9797), 1♂ 2 August 2021, M. A. O'Connor.

OFFALY: Turraun Wetlands (N1722), 1♂ 12 June 2021, R. Mc Kenna, determined C. McNaughton from photograph.

WESTMEATH: Lough Sheelin, Goreport (N4381), 1♀ 23 August 2021, C. McNaughton.

***Mystacides longicornis* (Linnaeus, 1758)**

ANTRIM: Greenmount Campus (J1584), near Six Mile Water and Lough Neagh, 1♂4♀♀ 29 June 2019, light-trap, R. Monteith.

CAVAN: bog near Finnea, Lough Sheelin (N4082), 1♀ 12 September 2021, light-trap, C. McNaughton.

DUBLIN: People's Garden Pond, Phoenix Park (O1334), 1♂ 19 May 2020, on hogweed beside the pond, J. O'Neill, confirmed J. P. O'Connor from photograph (National Biodiversity Data Centre).

Two larvae were collected in the pond by J. M. Caffrey in June 2007 (O'Connor and O'Connor, 2019).

***Oecetis furva* (Rambur, 1842)**

Recorded as new to County Roscommon from Grange (Lisheen) Lough (M9385) by O'Connor and Feeley (2021).

***Oecetis notata* (Rambur, 1842)**

Recorded as new to County Meath from the River Boyne (N8868) by O'Connor (2020b).

***Oecetis ochracea* (Curtis, 1825)**

CAVAN: bog near Finnea, Lough Sheelin (N4082), 2♀♀ 12 September 2021, light-trap, C. McNaughton.

OFFALY: Turraun Wetlands (N1722), adult 16 May 2021, R. Mc Kenna, determined C. McNaughton, from photograph.

Previously only known in County Offaly from the nearby Lough Boora (N1818) (O'Connor and O'Connor, 2018).

WESTMEATH: Goreport shore, Lough Sheelin (N4381), 1♀ 1 July 2020, C. McNaughton.

***Triaenodes bicolor* (Curtis, 1834)**

CAVAN: Lough Sheelin, Crover (N4786), 1♀ 8 September 2021, light-trap, C. McNaughton.

WESTMEATH: Lough Sheelin, Goreport shore (N4381), 1♂ 1 July 2020, C. McNaughton.

***Ylodes reuteri* (McLachlan, 1880)**

WATERFORD: Tramore (S5701), 1♀ 29 May 2020, light-trap, T. Bryant.

The above date is the earliest adult one for the species in Ireland.

Acknowledgements

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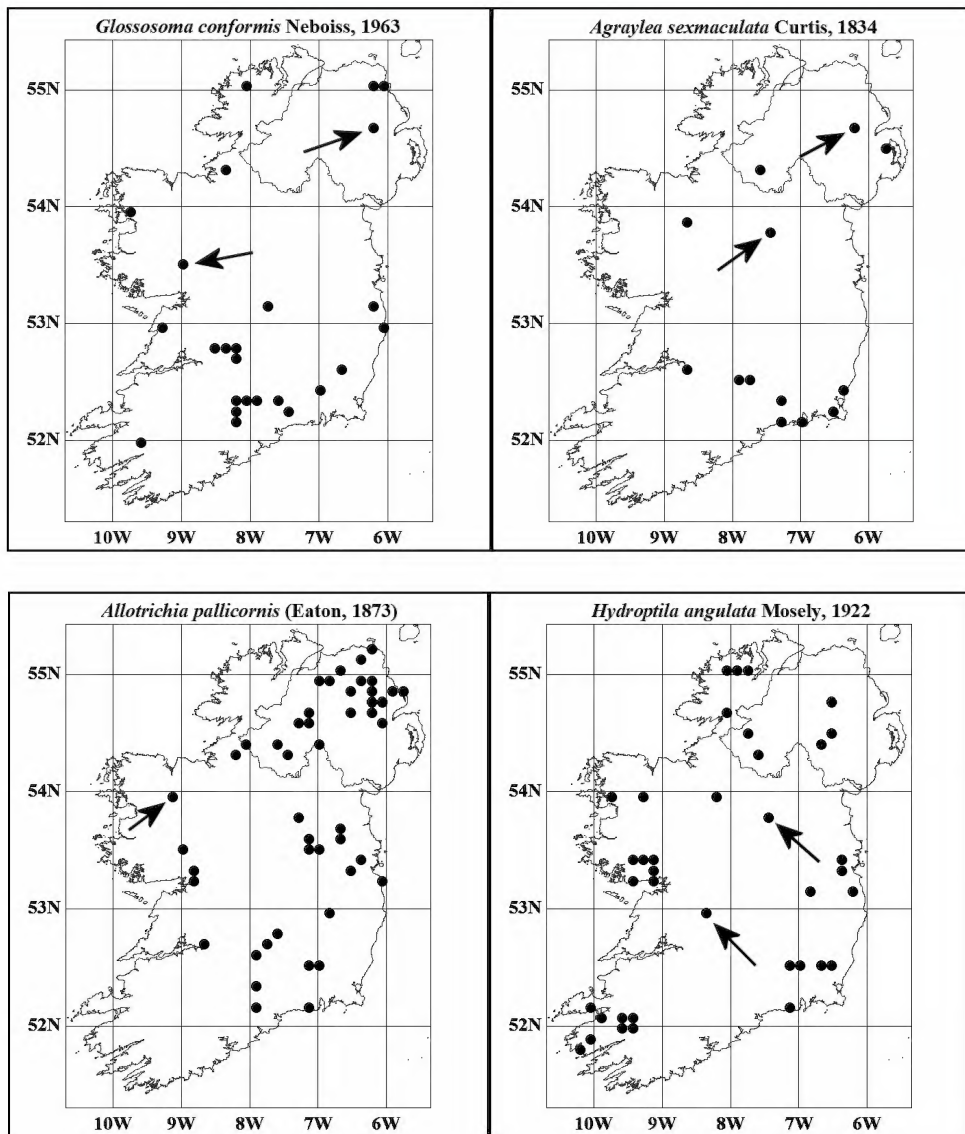
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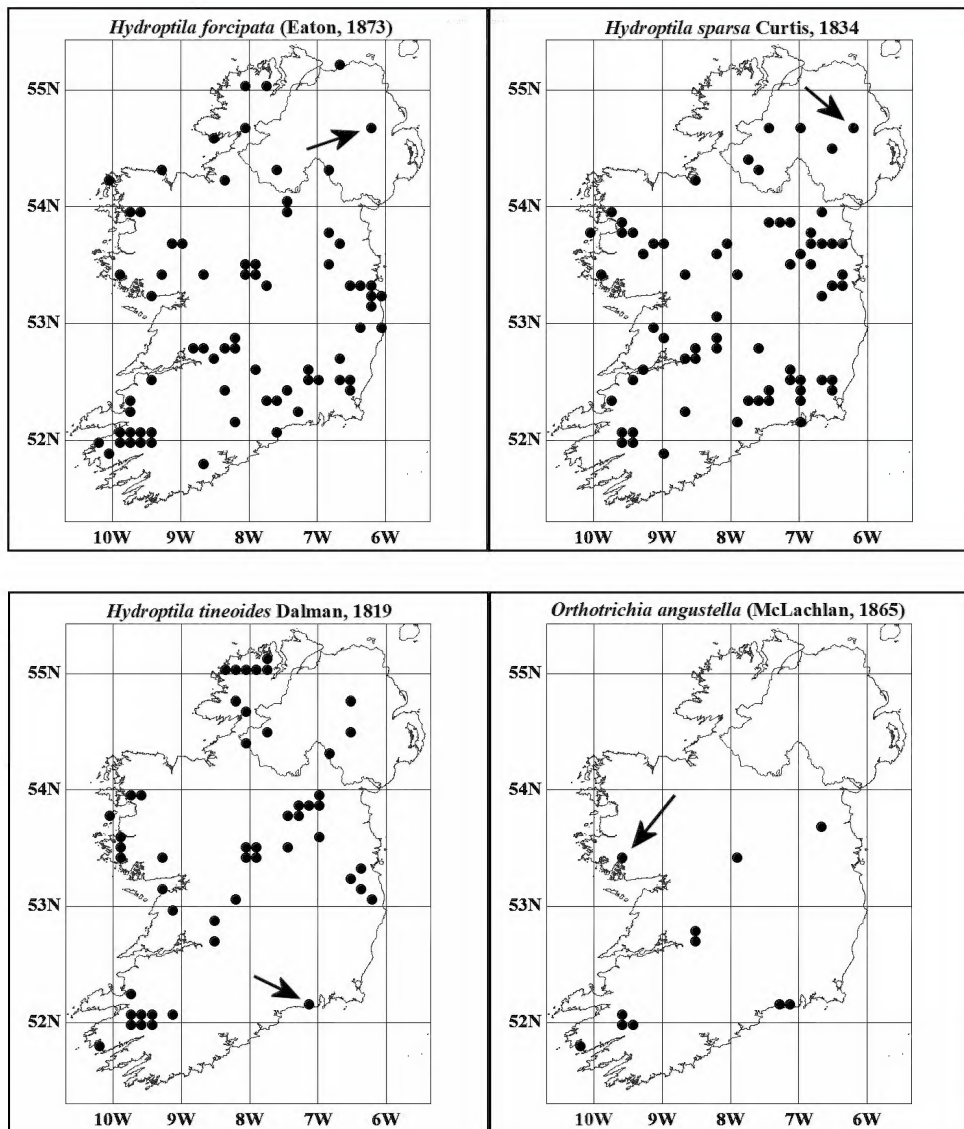
PLATE 1. *Grammotaulius nigropunctatus* (Retzius), adult, 30 May 2020, Shanahoe, Laois, Chris Uys. Photograph: Chris Uys (per National Biodiversity Data Centre).



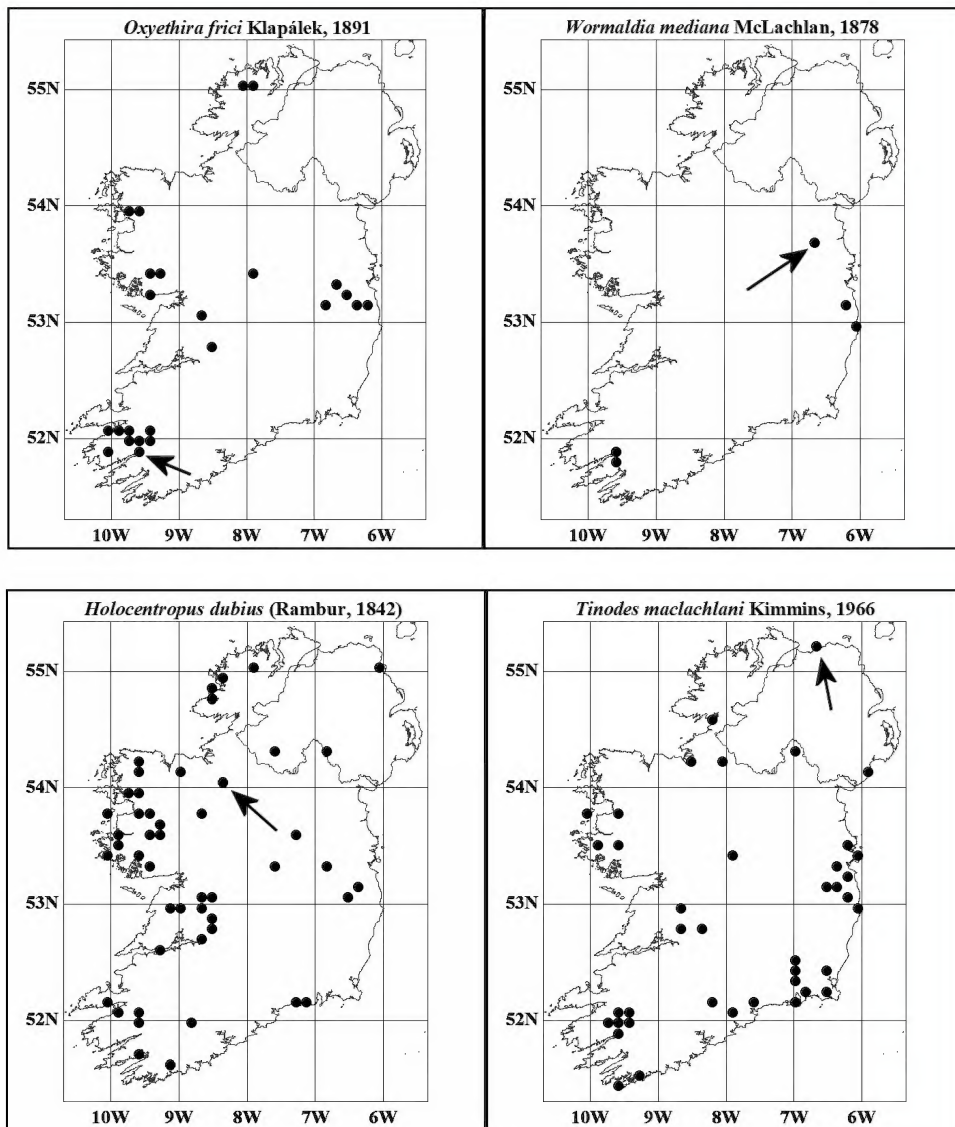
PLATE 2. *Limnephilus rhombicus* (Linnaeus), adult, 18 June 2020, Shanahoe, Laois, Chris Uys. Photograph: Chris Uys (per National Biodiversity Data Centre).



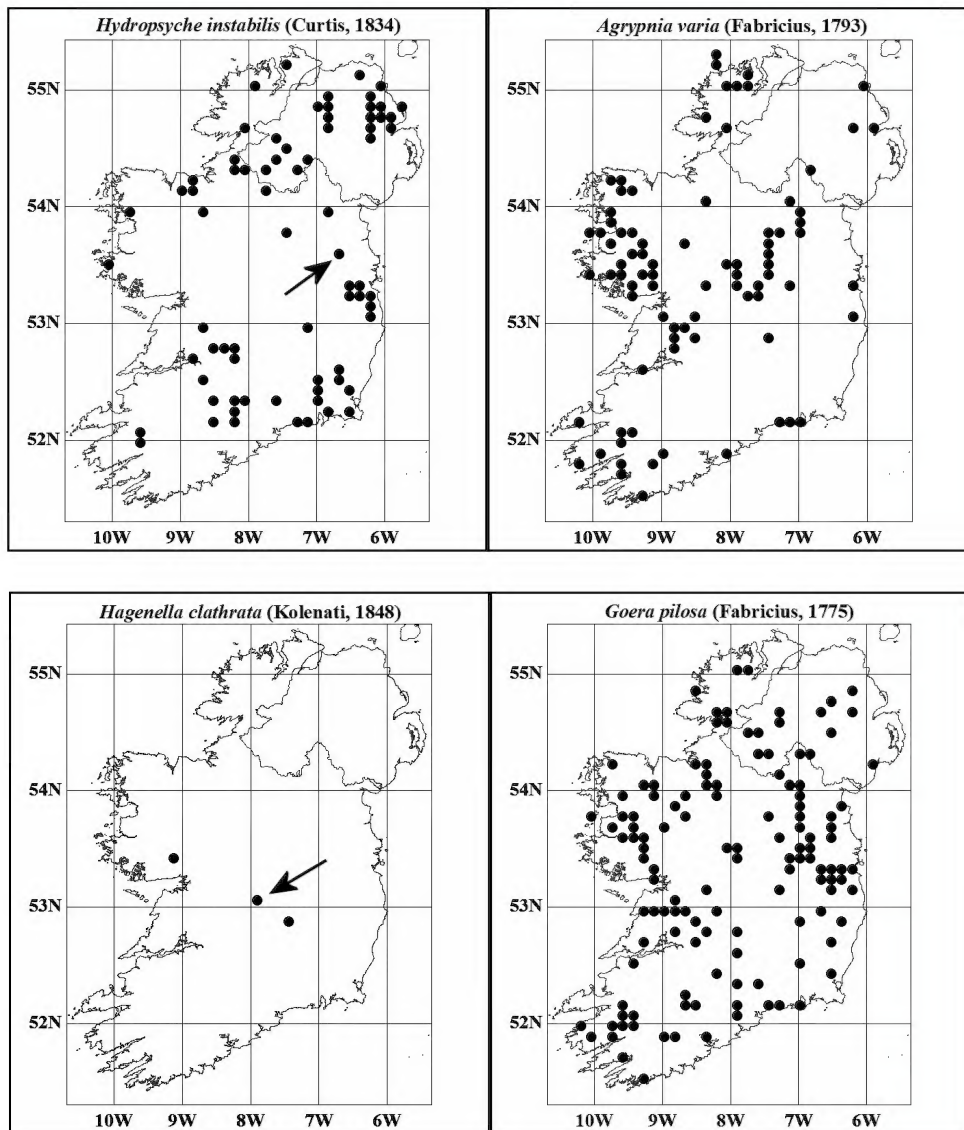
FIGURES 1-4. The known Irish distributions of *Glossosoma conformis* Neboiss, 1963, *Agraylea sexmaculata* Curtis, 1834, *Allotrichia pallicornis* (Eaton, 1873) and *Hydroptila angulata* Mosely, 1922. New county records are indicated by arrows.



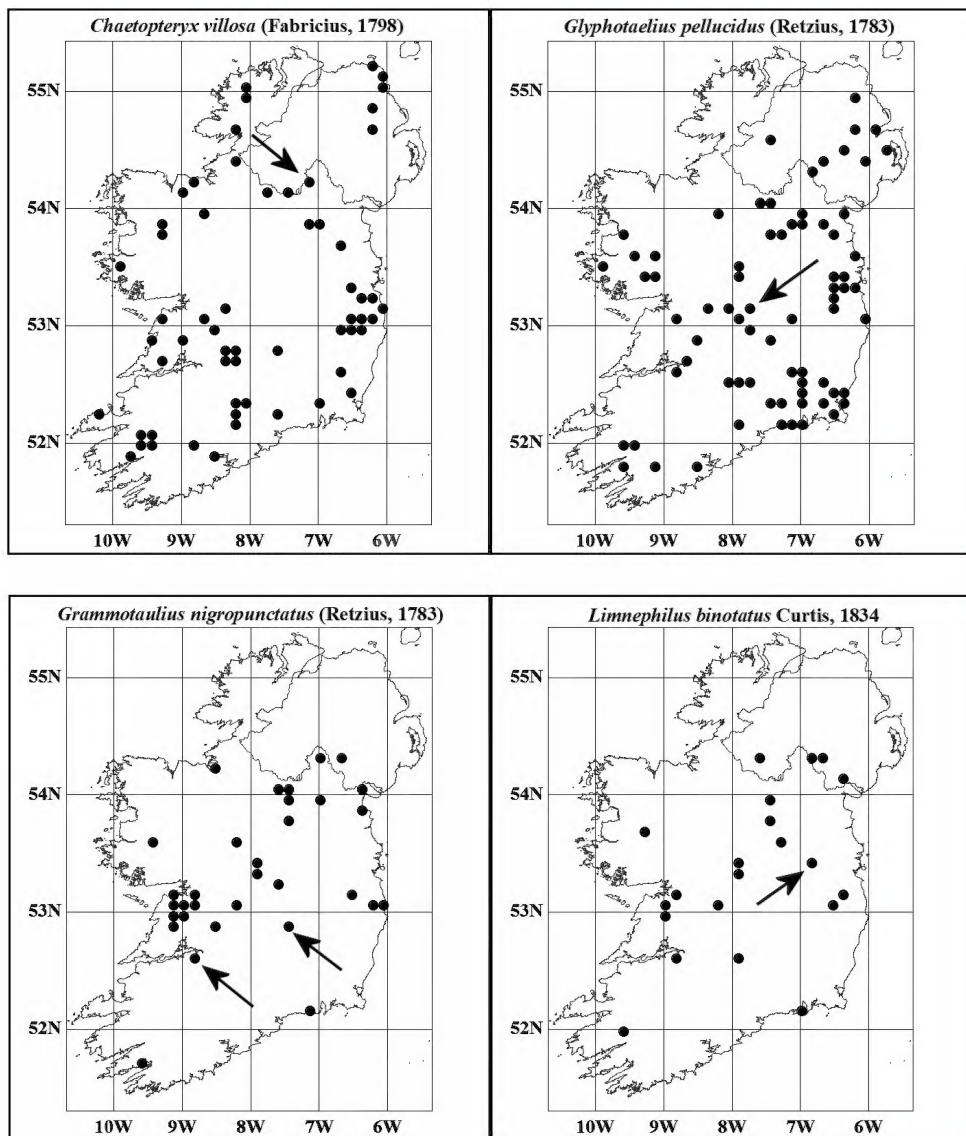
FIGURES 5-8. The known Irish distributions of *Hydroptila forcipata* (Eaton, 1873), *Hydroptila sparsa* Curtis, 1834, *Hydroptila tineoides* Dalman, 1819 and *Orthotrichia angustella* (McLachlan, 1865). New county records are indicated by arrows.



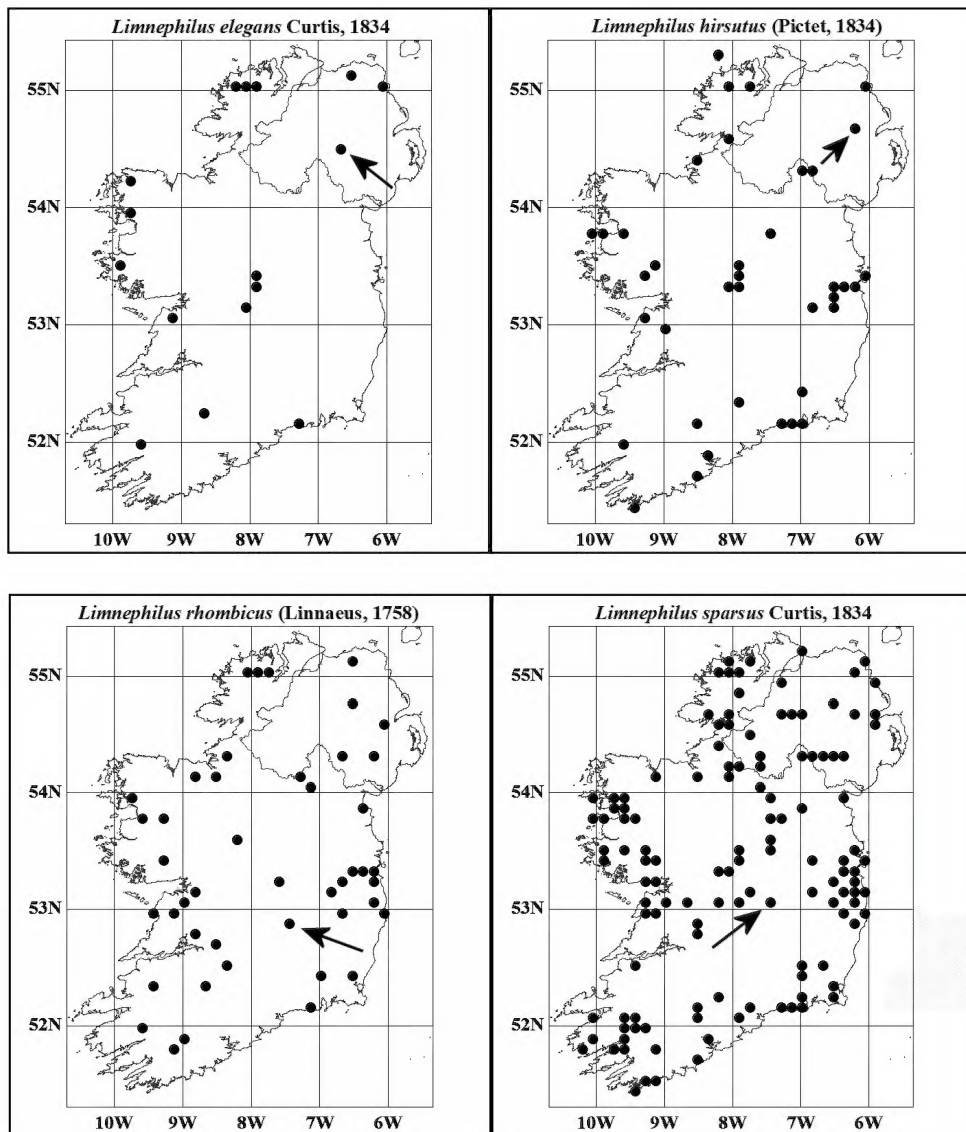
FIGURES 9-12. The known Irish distributions of *Oxyethira frici* Klapálek, 1891, *Wormaldia mediana* McLachlan, 1878, *Holocentropus dubius* (Rambur, 1842) and *Tinodes maclachlani* Kimmins, 1966. New county records are indicated by arrows.



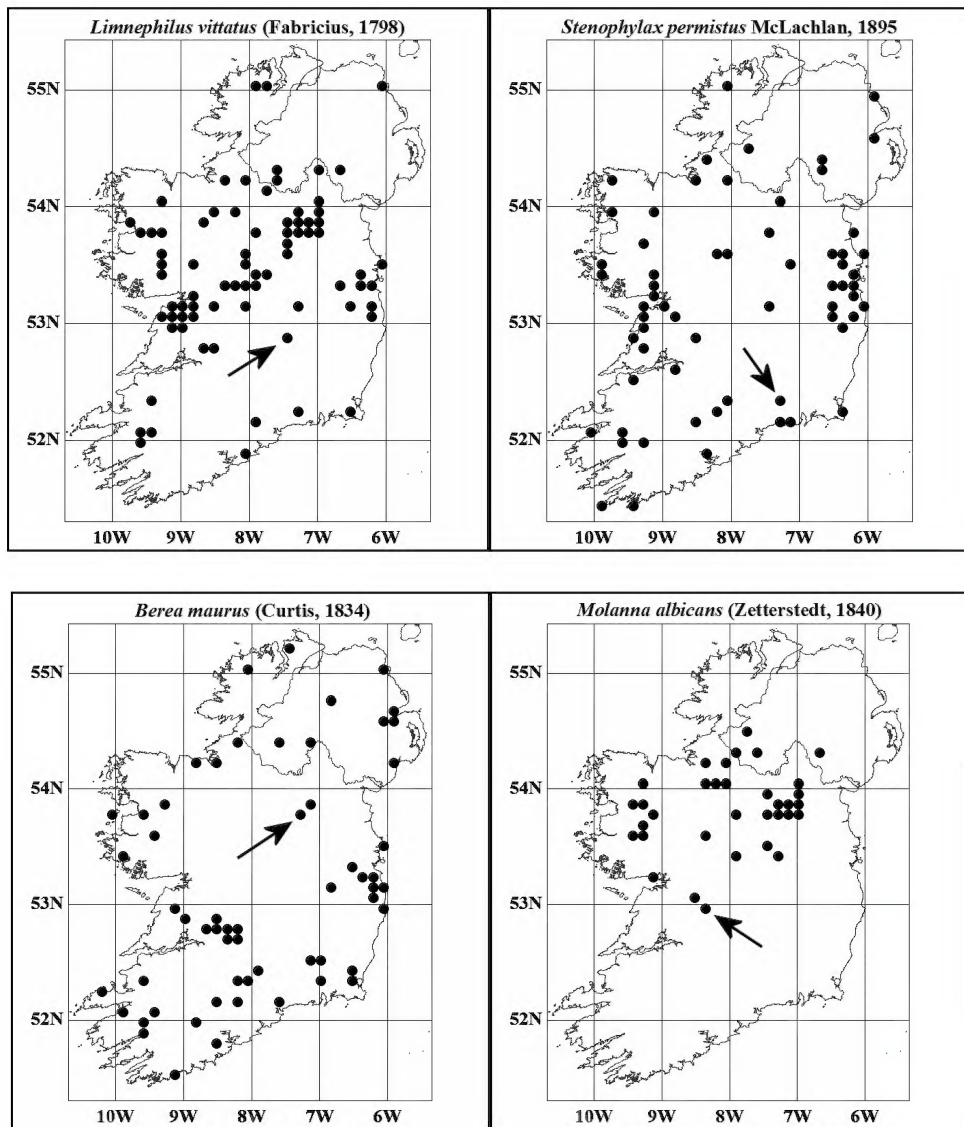
FIGURES 13-16. The known Irish distributions of *Hydropsyche instabilis* (Curtis, 1834), *Agrypnia varia* (Fabricius, 1793), *Hagenella clathrata* (Kolenati, 1848) and *Goera pilosa* (Fabricius, 1775). New county records are indicated by arrows.



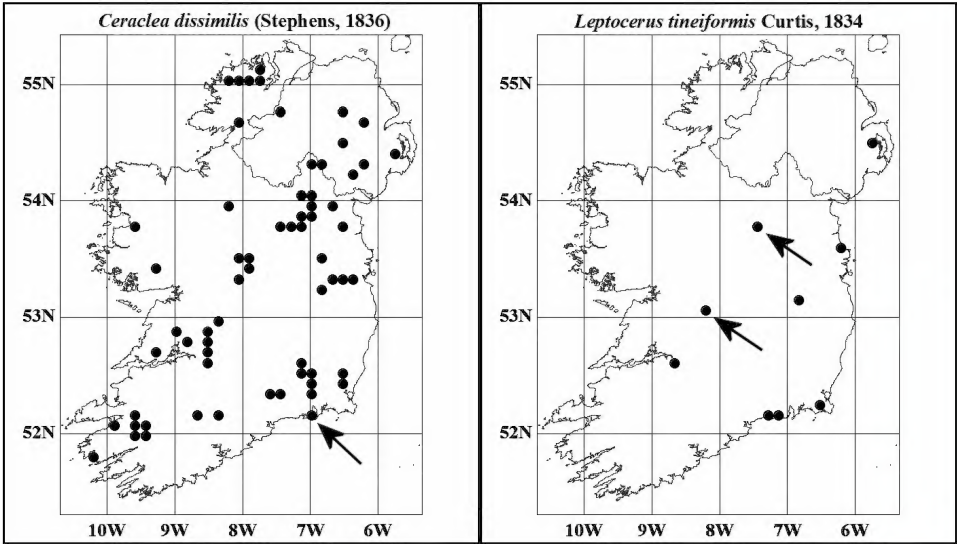
FIGURES 17-20. The known Irish distributions of *Chaetopteryx villosa* (Fabricius, 1798), *Glyptotaelius pellucidus* (Retzius, 1783), *Grammotaelius nigropunctatus* (Retzius, 1783) and *Limnephilus binotatus* Curtis, 1834. New county records are indicated by arrows



FIGURES 21-24. The known Irish distributions of *Limnephilus elegans* Curtis, 1834, *Limnephilus hirsutus* (Pictet, 1834), *Limnephilus rhombicus* (Linnaeus, 1758) and *Limnephilus sparsus* Curtis, 1834. New county records are indicated by arrows.



FIGURES 25-28. The known Irish distributions of *Limnephilus vittatus* (Fabricius, 1798), *Stenophylax permistus* McLachlan, 1895, *Beraea maurus* (Curtis, 1834) and *Molanna albicans* (Zetterstedt, 1840). New county records are indicated by arrows.



FIGURES 29-30. The known Irish distributions of *Ceraclea dissimilis* (Stephens, 1836) and *Leptocerus tineiformis* Curtis, 1834. New county records are indicated by arrows.

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Atlas of the Irish Trichoptera (Caddisflies) by James P. O'Connor

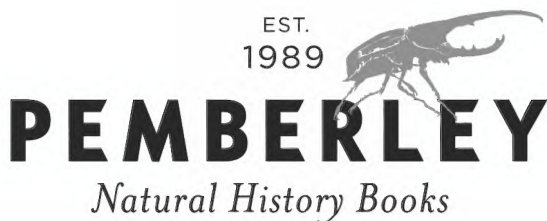


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